ILD/COPD Analysis with Image Metrics and PFT patterns

We compare the correlation of image metrics and the PFT values for two diseases: ILD and COPD. For each disease group, a subset is selected from Eduardo's database. The image metrics are computed from Spiromics pipeline. The PFT values are from Eduardo's excel file(first line for each subject). We are interested in if the metrics purely computed from the CT scanning are correlated with any quantitative physical test results; what's more, if there is, if such a correlation the same for different disease or not.

The ILD dataset is [2, 4, 5, 6, 7, 12, 15, 17, 24, 27, 28, 31, 35, 44, 45, 48, 50, 51, 53, 54, 57]. (**A homogeneous subset of ILD is needed? re: Drew's email**). The COPD dataset is [8, 9, 10, 16, 18, 19, 20, 22, 25, 26, 34, 36, 37, 38, 39, 40, 52, 55, 56].

There are 21 values from PFT for each subject. For image metrics, there are four groups for each subject.

1. whole lung of inspiration (total 30 values)
2. whole lung of expiration (total 30 values)
3. the metrics from inspiration minus the metrics from expiration (total 30 values)
4. the metrics on the Jacobian from the registration from expiration to inspiration (total 10 values)

In each pair for correlation test, the rho value and p value are displayed separately. The color maps for both have been carefully designed. For the rho value, which is the correlation factor ranging from -1 to +1, the maximum correlation (+1) is displayed toward red in orange hue with the maximum inverse correlation (-1) toward red in purple hue, the least correlation (0) is toward light blue/green.

For the p value, the color map has been adjusted nonlinearly. Toward the confidence end (1), it is displayed toward red. Otherwise (from 0.15 to 1) it is in blue. The consistent in blue in this large range is made on purpose as any p value larger then 0.2 indicates no correlation.

We have three types of correlation tests.

1. correlation of image metrics vs PFT.

2. correlation of PFT vs PFT

3. correlation of image metrics vs image metrics.

The test contents are reflected in the titles of the figures. For example: "rho-ILD—-metrics-vs-PFT—-Whole-Lung-Expiration" means the rho value of ILD case from the correlation of image metrics to PFT using the whole lung expiration image. The following lists the total 36 figures, which are these figures are indexed in tables for your convenience.

PFT vs.	inspiration	expiration	inspiration minus expiration	Jacobian from registration
ILD	Fig.1, 2	Fig.3, 4	Fig.5, 6	Fig.7, 8
COPD	Fig.9, .10	Fig.11, .12	Fig.13, .14	Fig.15, .16

self correlation	PFT
ILD	Fig.17, 18
COPD	Fig.19, .20

self correlation	inspiration	expiration	inspiration minus expiration	Jacobian from registration
ILD	Fig.21, 22	Fig.23, 24	Fig.25, 26	Fig.27, 28
COPD	Fig.29, 30	Fig.31, 32	Fig.33, .34	Fig.35, 36

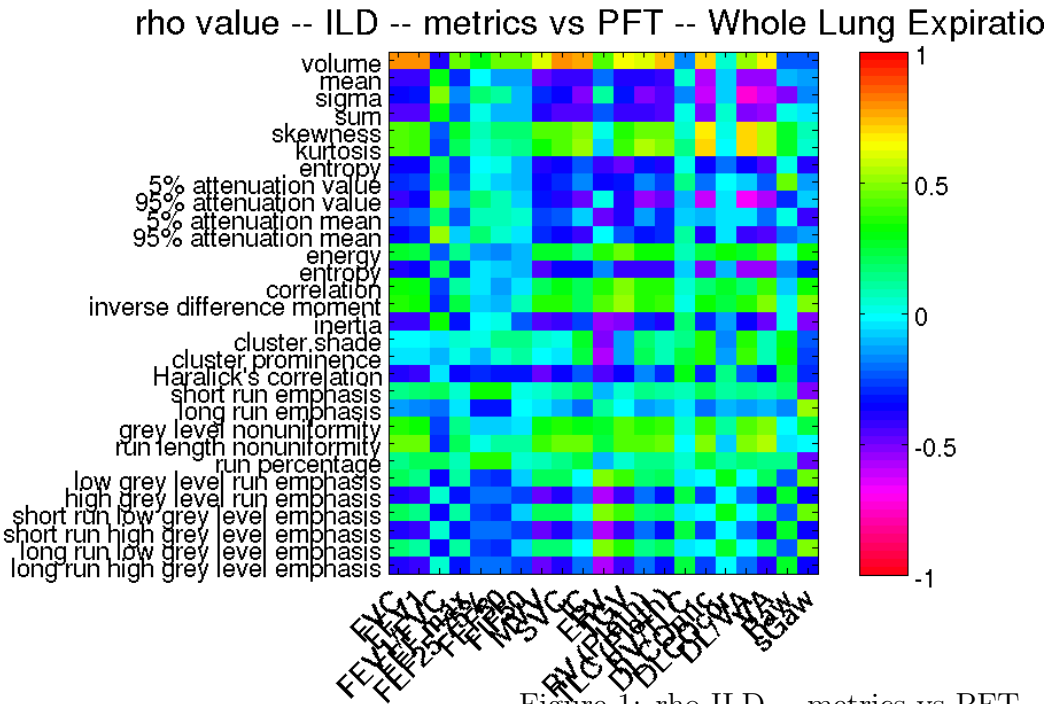

Figure 1: rho-ILD—-metrics-vs-PFT—-Whole-Lung-Expiration

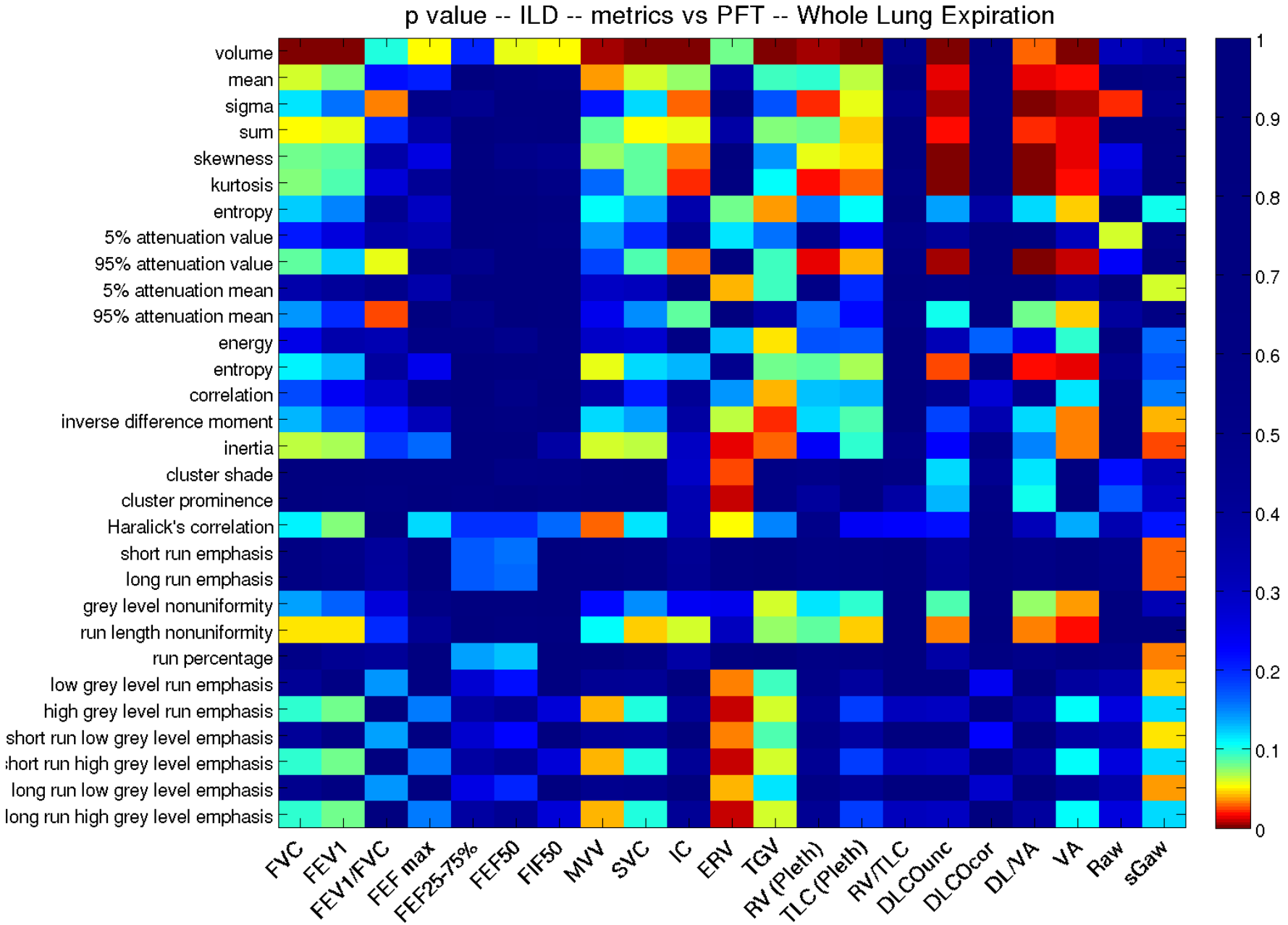

Figure 2: p-ILD—-metrics-vs-PFT—-Whole-Lung-Expiration

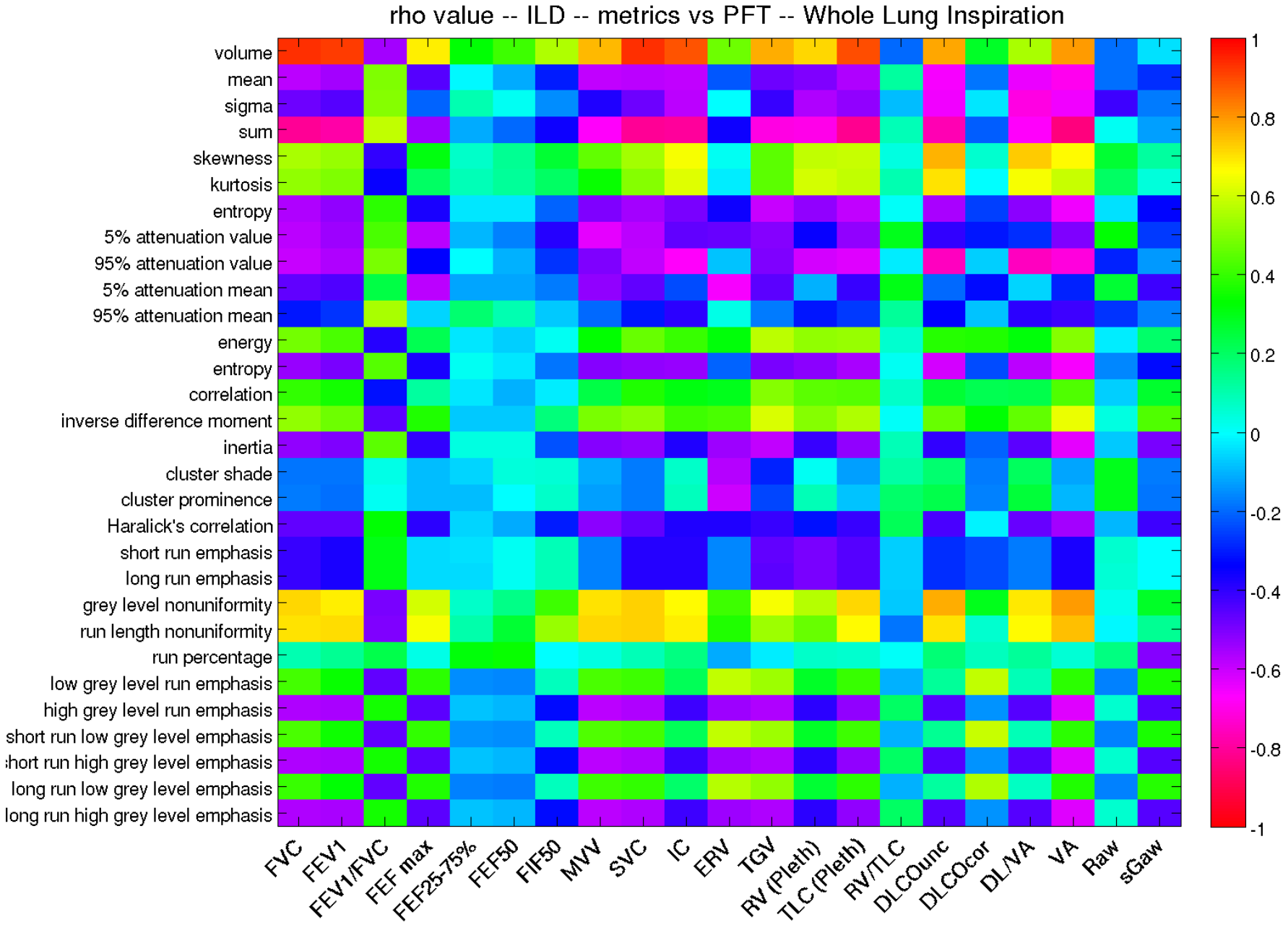

Figure 3: rho-ILD—-metrics-vs-PFT—-Whole-Lung-Inspiration

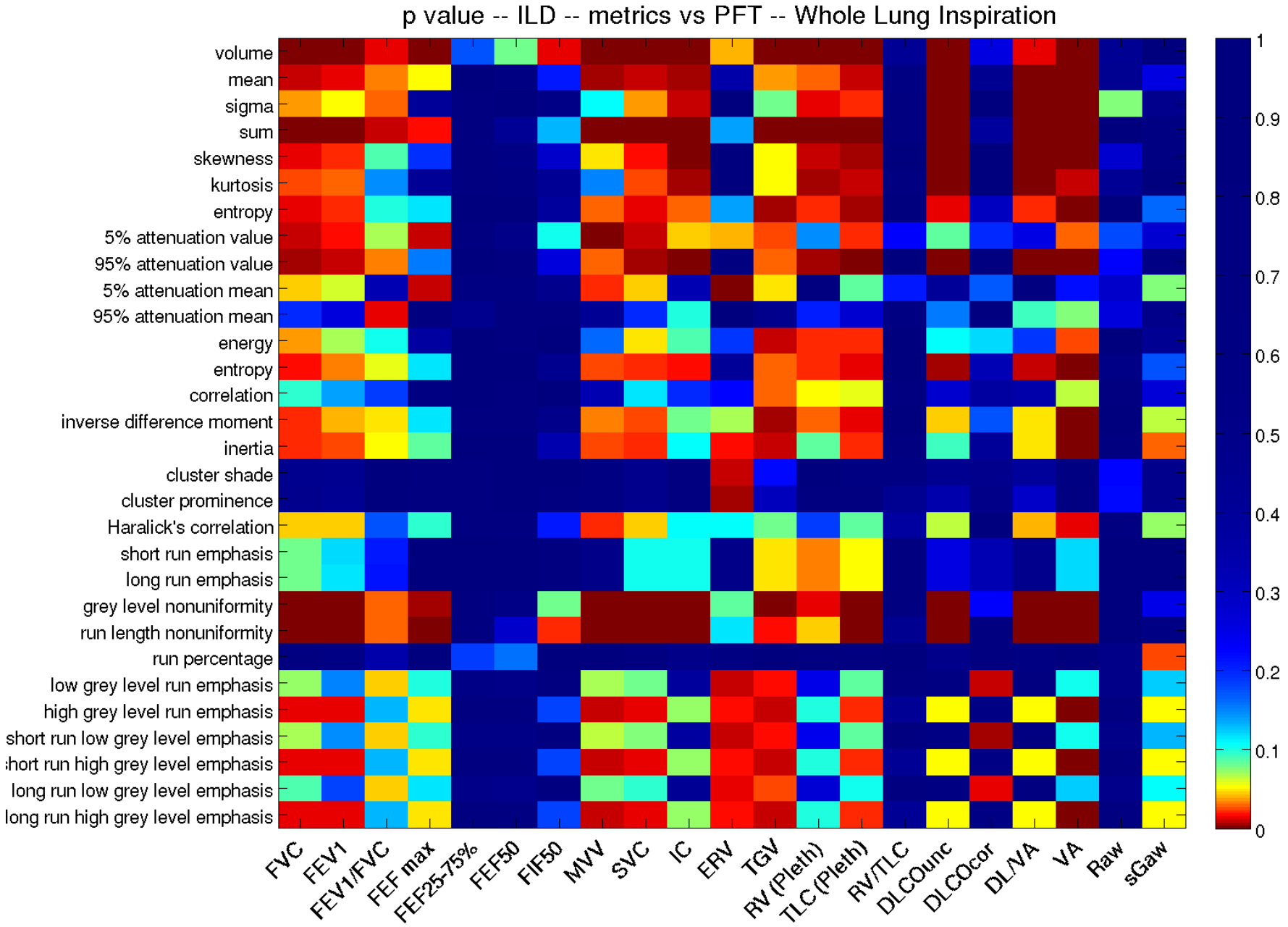

Figure 4: p-ILD—-metrics-vs-PFT—-Whole-Lung-Inspiration

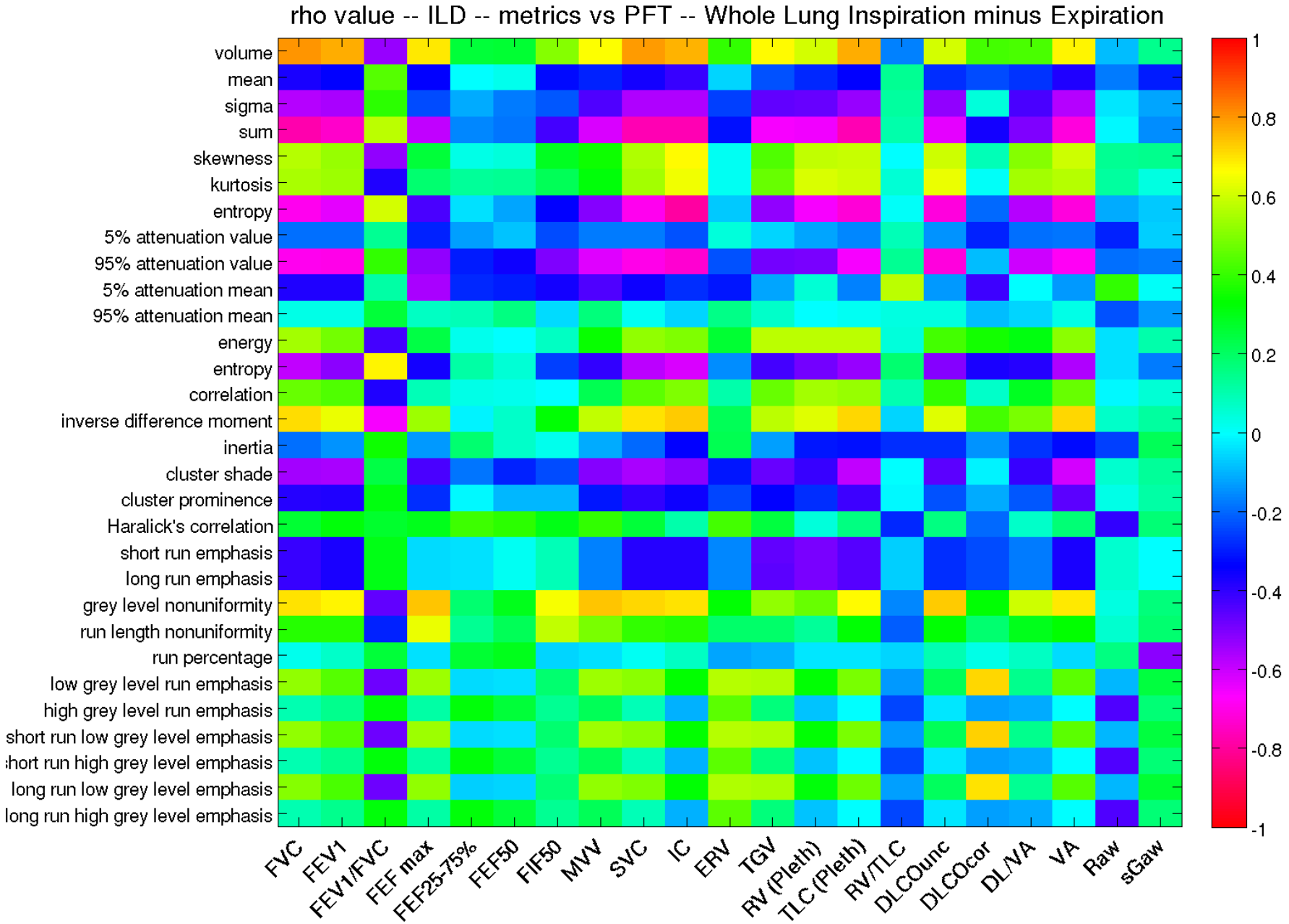

Figure 5: rho-ILD—-metrics-vs-PFT—-Whole-Lung-Inspiration-minus-Expiration

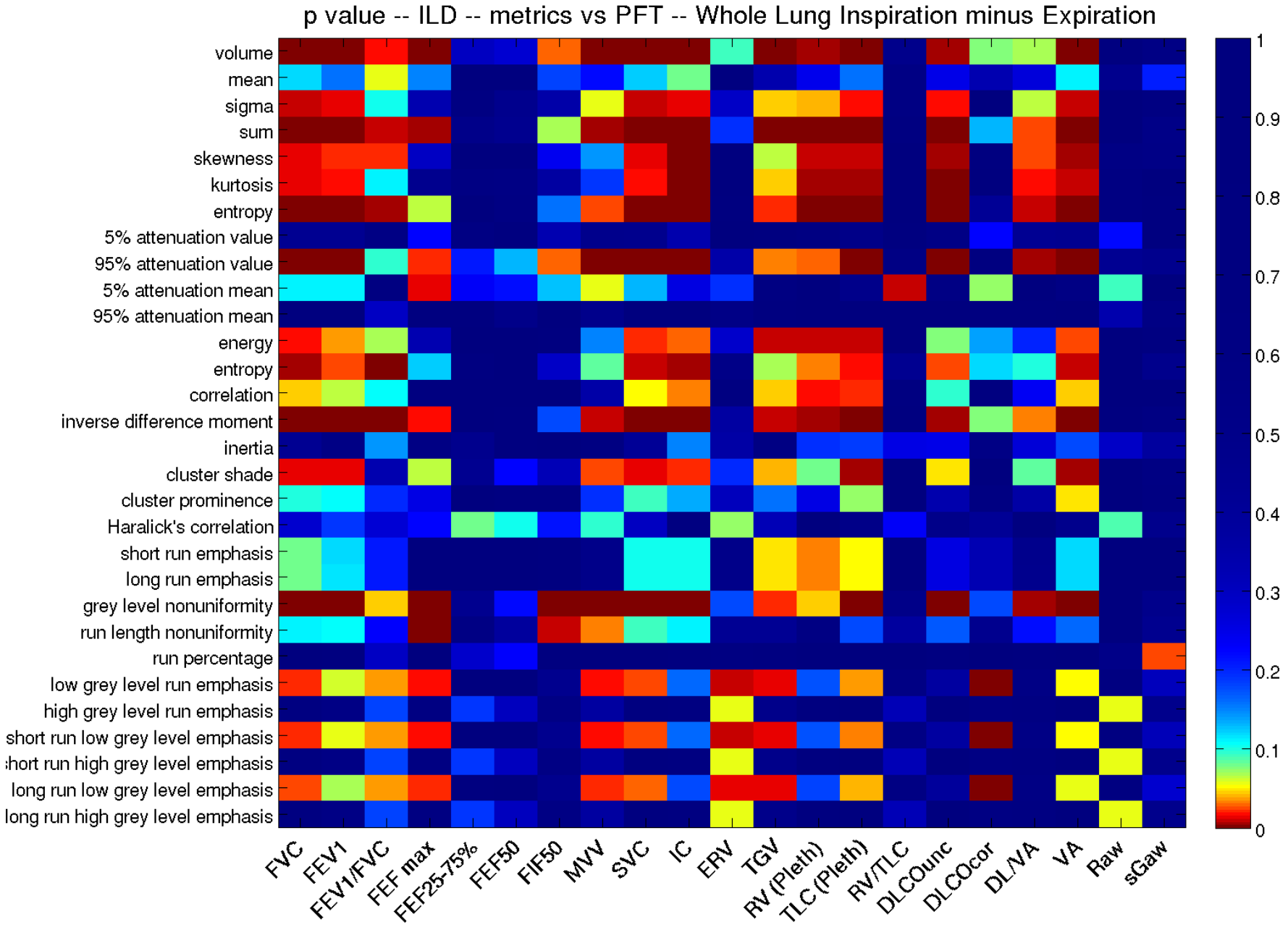

Figure 6: p-ILD—-metrics-vs-PFT—-Whole-Lung-Inspiration-minus-Expiration

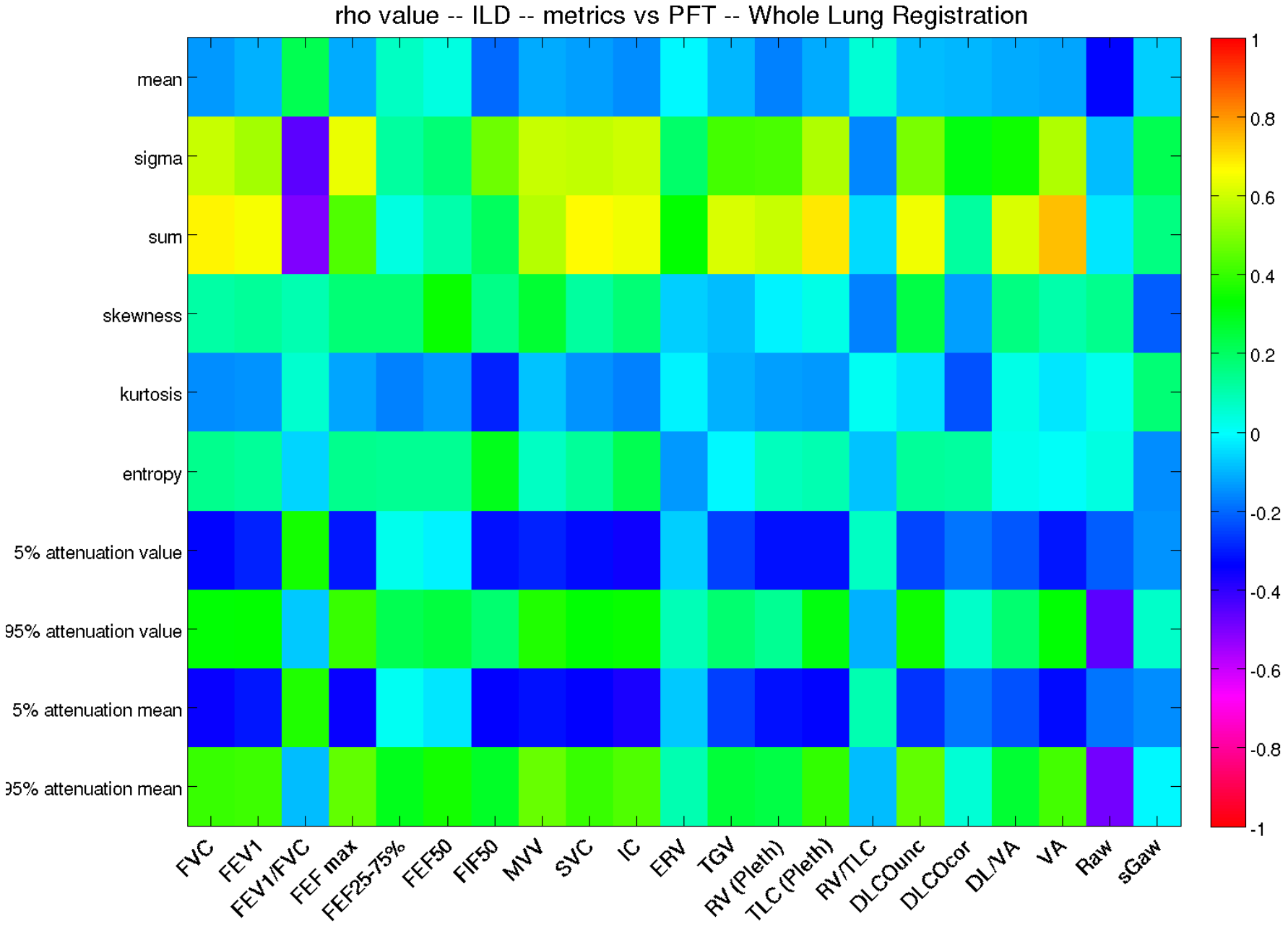

Figure 7: rho-ILD—-metrics-vs-PFT—-Whole-Lung-Registration

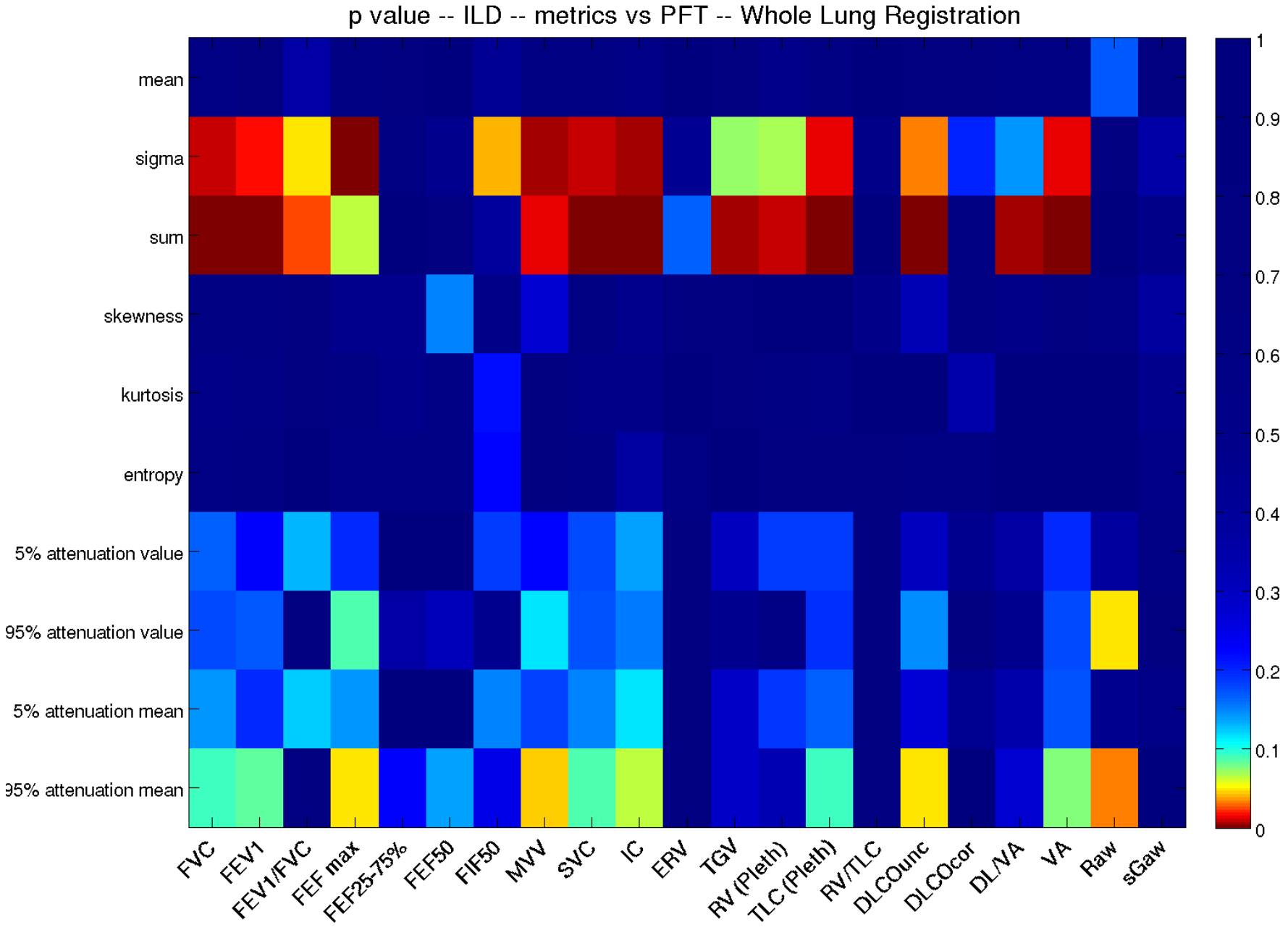

Figure 8: p-ILD—-metrics-vs-PFT—-Whole-Lung-Registration

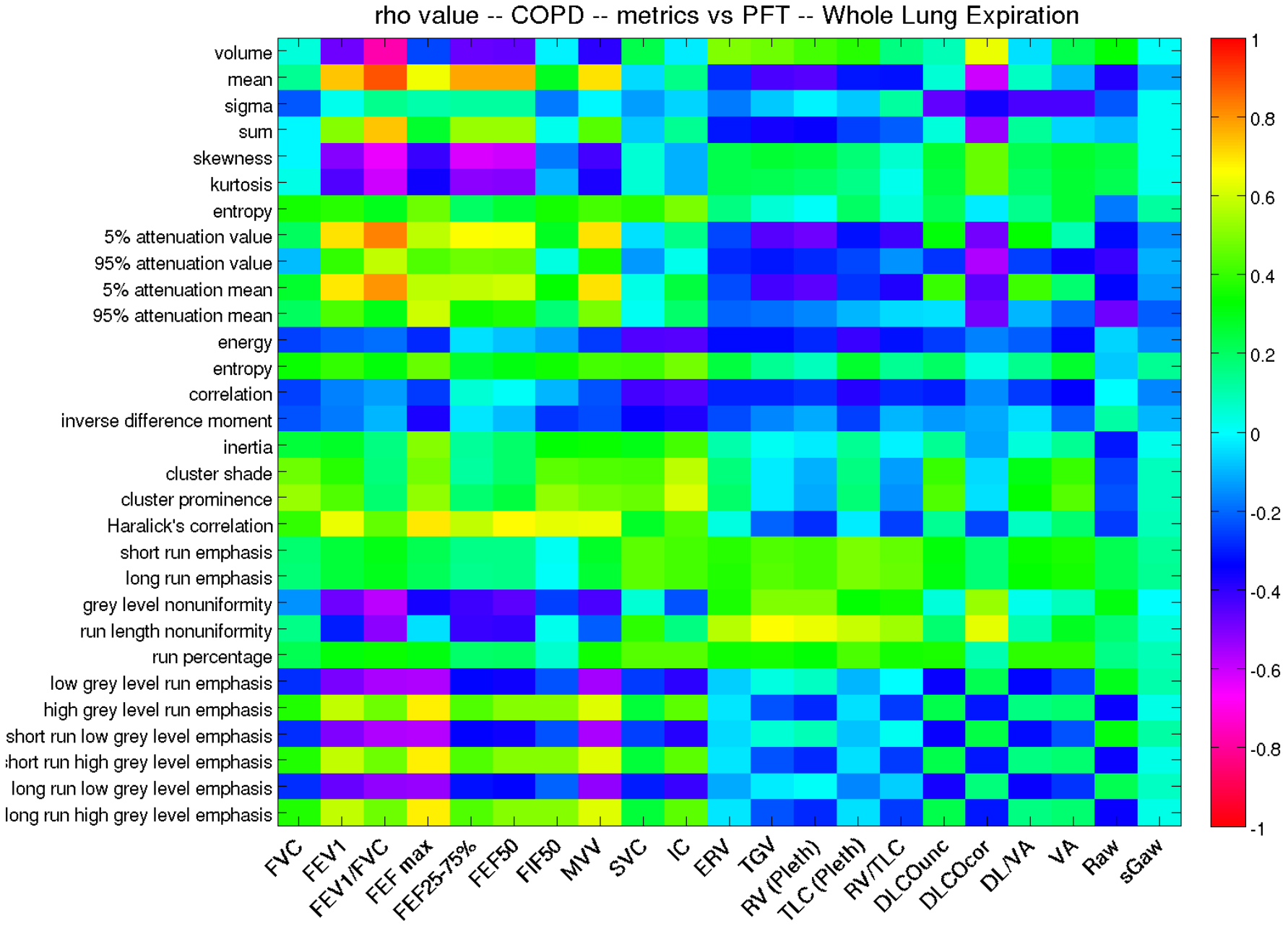

Figure 9: rho-COPD—-metrics-vs-PFT—-Whole-Lung-Expiration

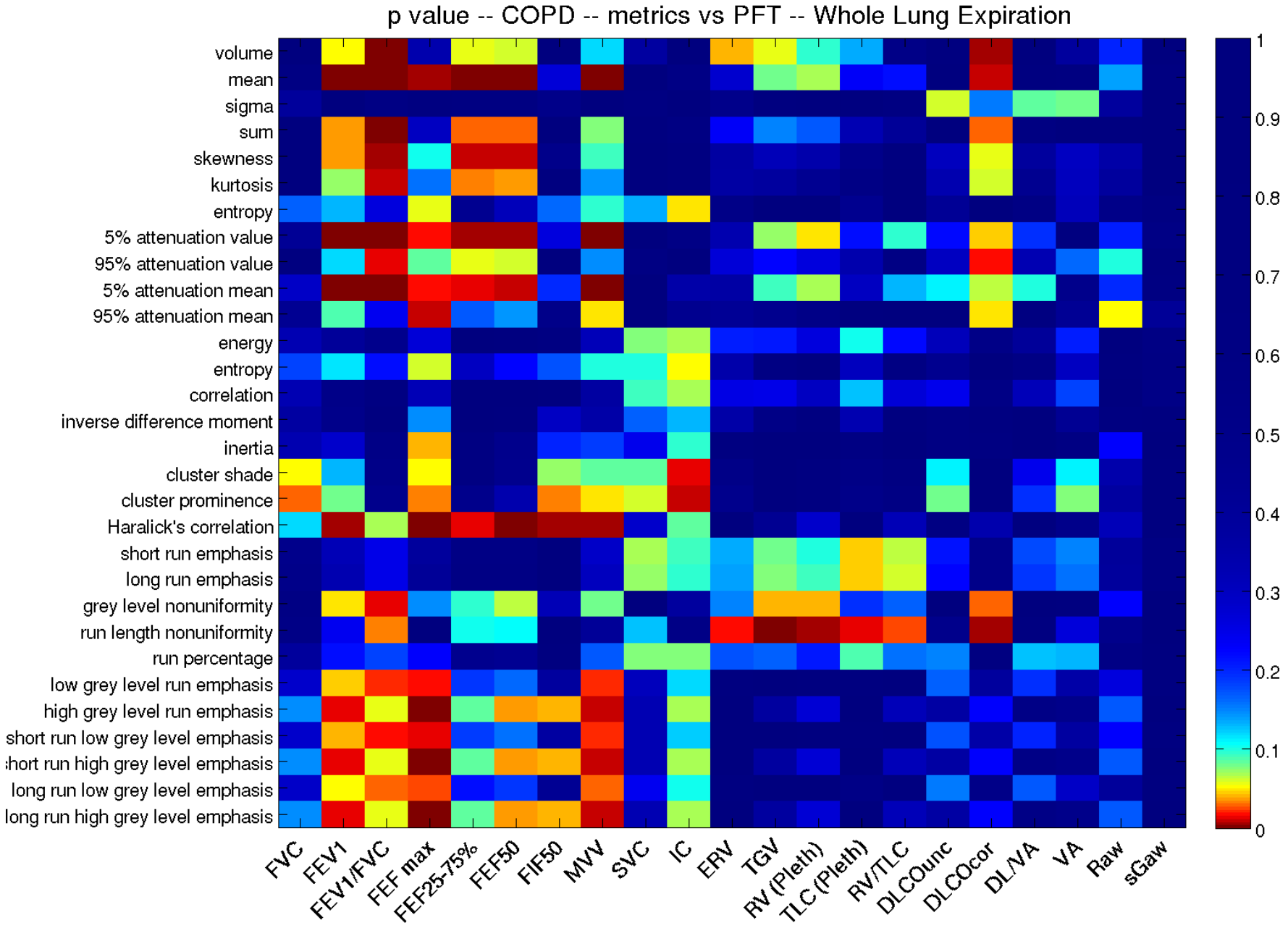

Figure 10: p-COPD—-metrics-vs-PFT—-Whole-Lung-Expiration

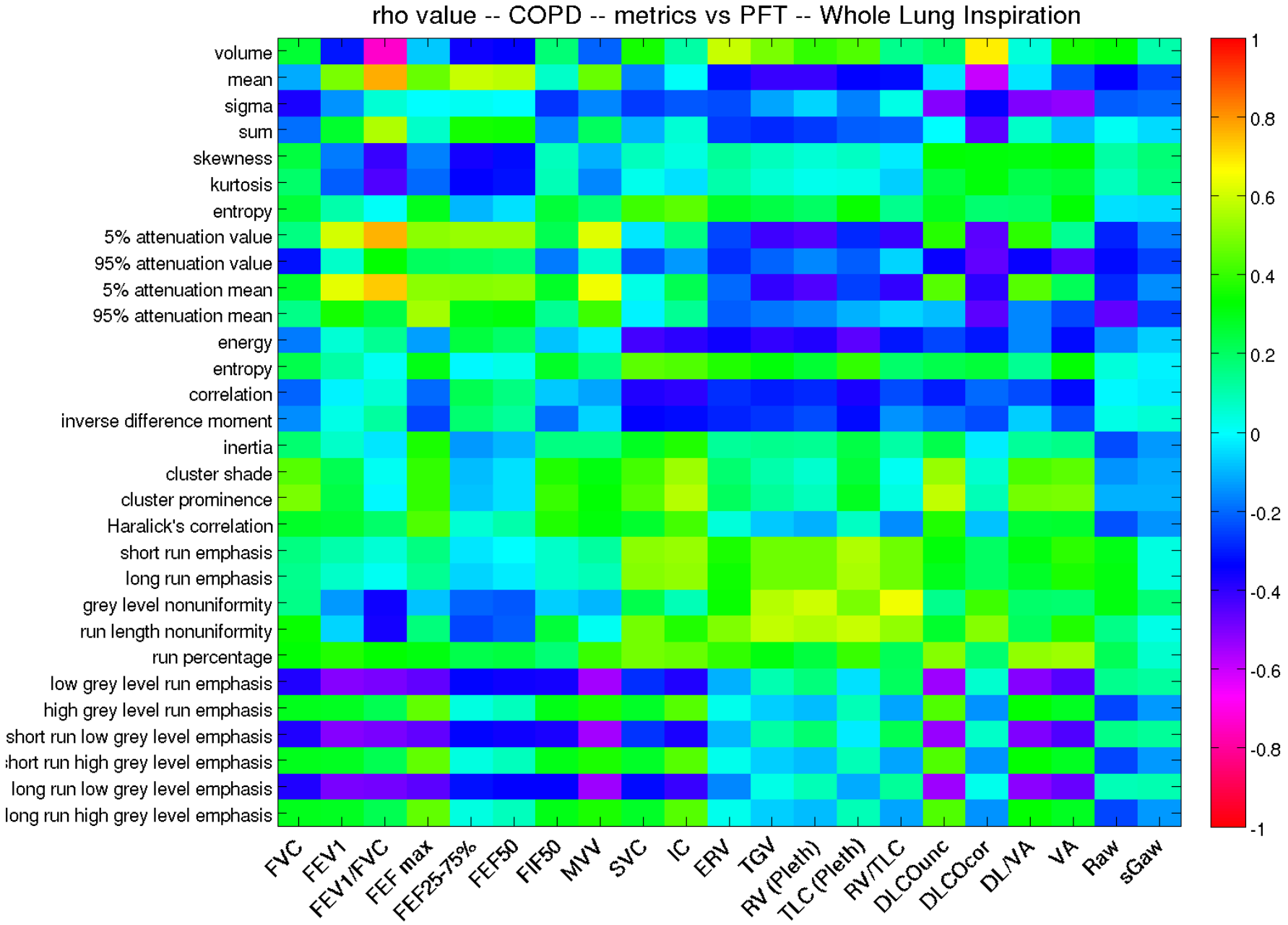

Figure 11: rho-COPD—-metrics-vs-PFT—-Whole-Lung-Inspiration

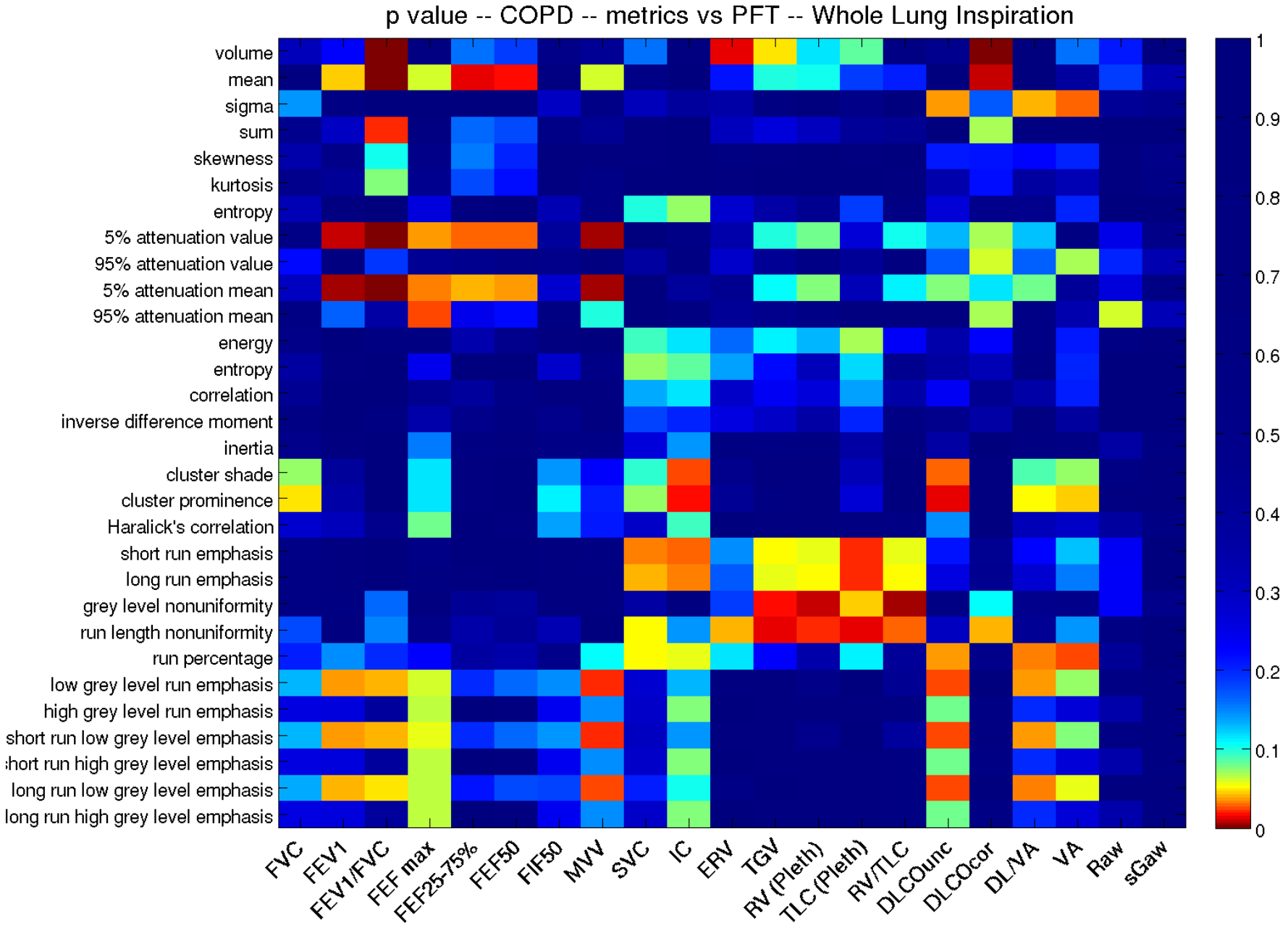

Figure 12: p-COPD—-metrics-vs-PFT—-Whole-Lung-Inspiration

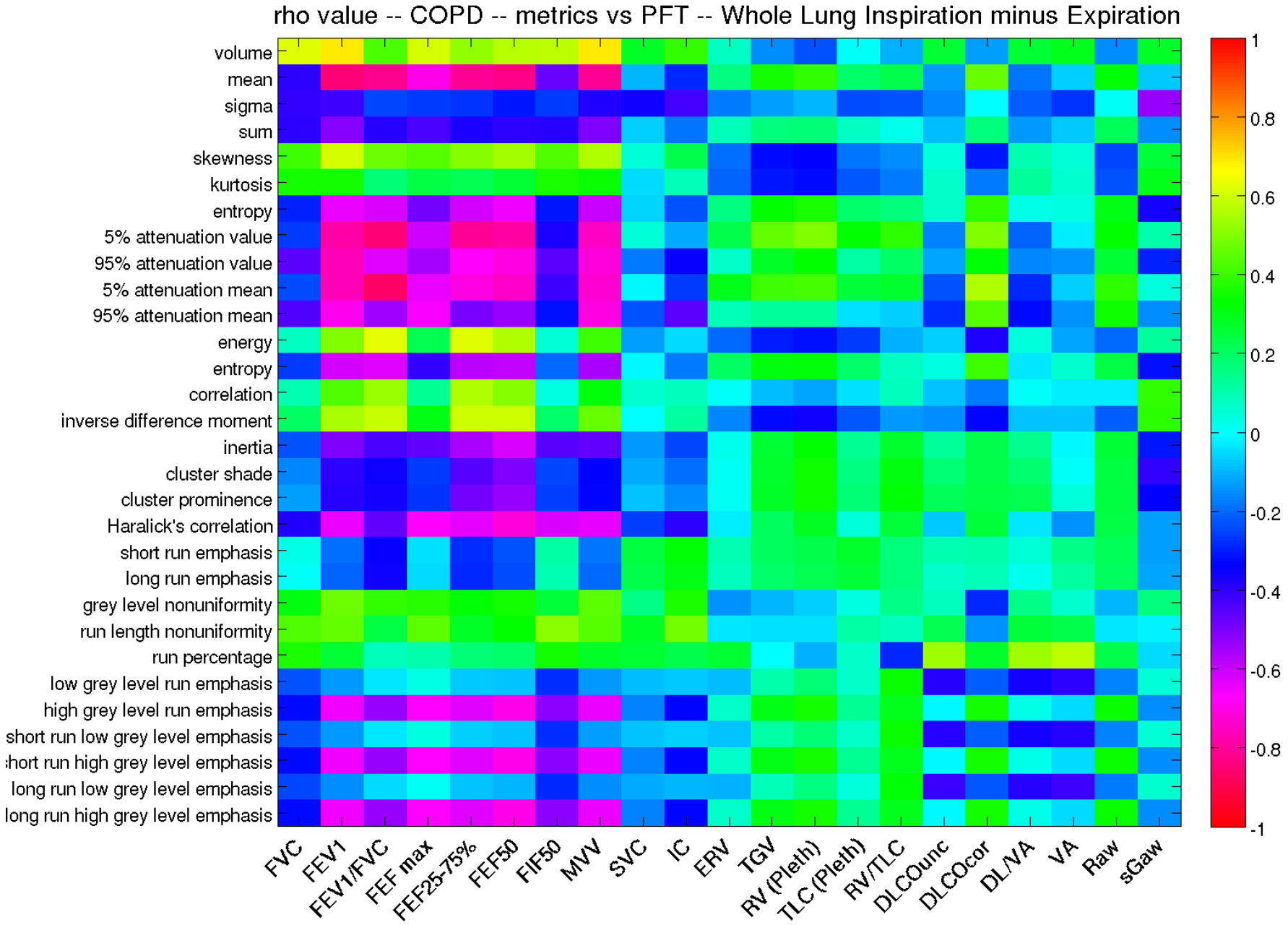

Figure 13: rho-COPD—-metrics-vs-PFT—-Whole-Lung-Inspiration-minus-Expiration

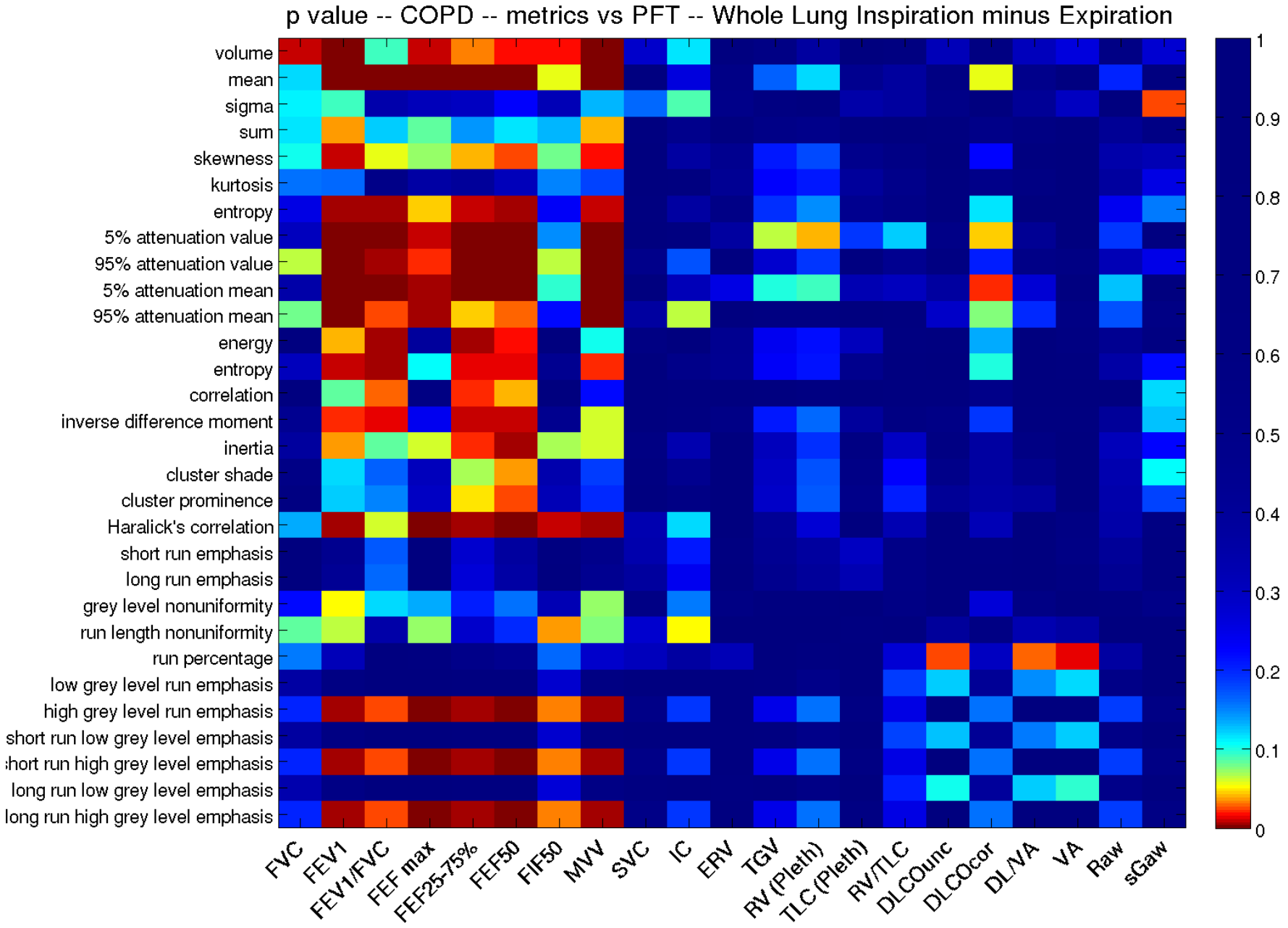

Figure 14: p-COPD—-metrics-vs-PFT—-Whole-Lung-Inspiration-minus-Expiration

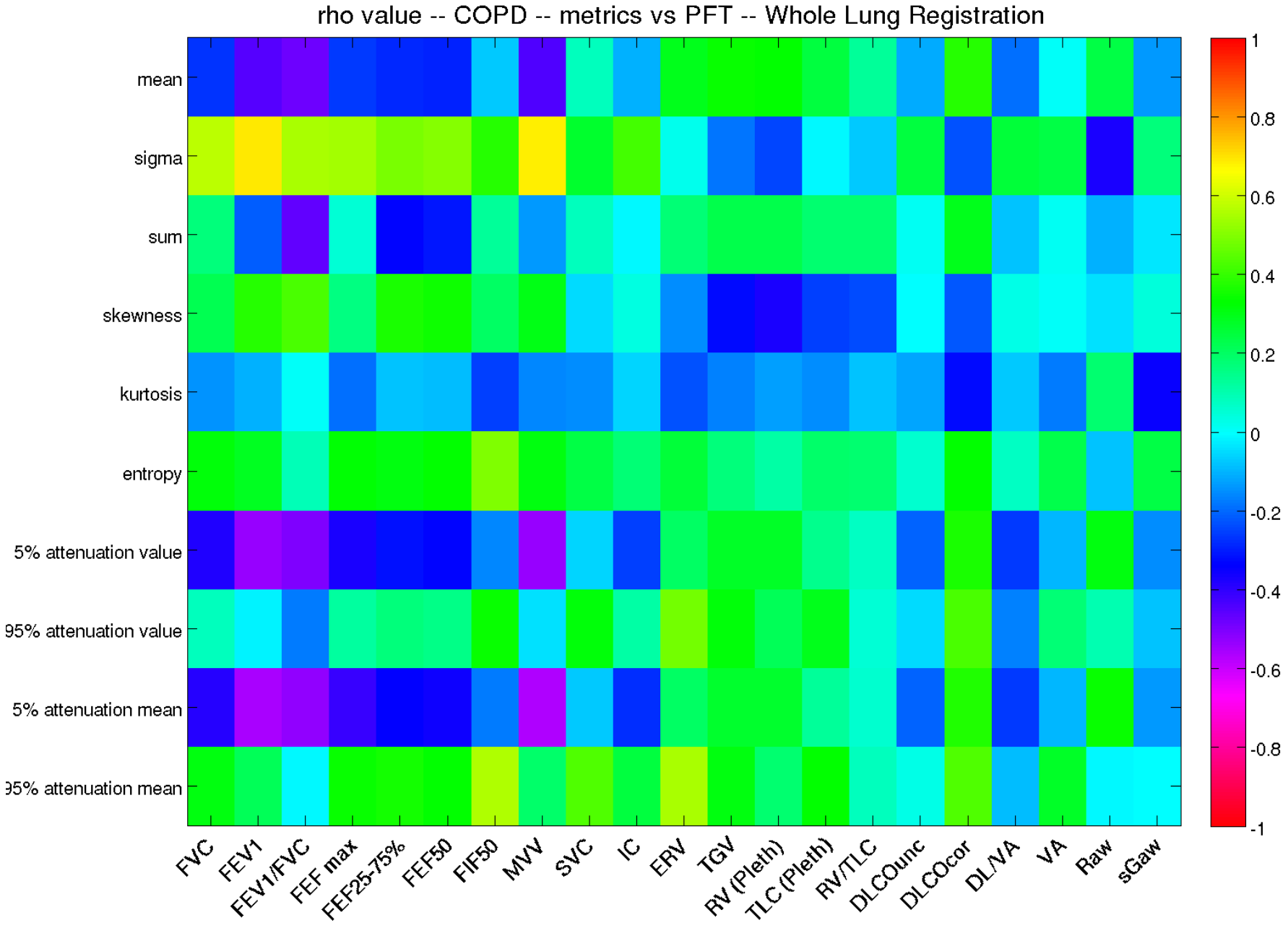

Figure 15: rho-COPD—-metrics-vs-PFT—-Whole-Lung-Registration

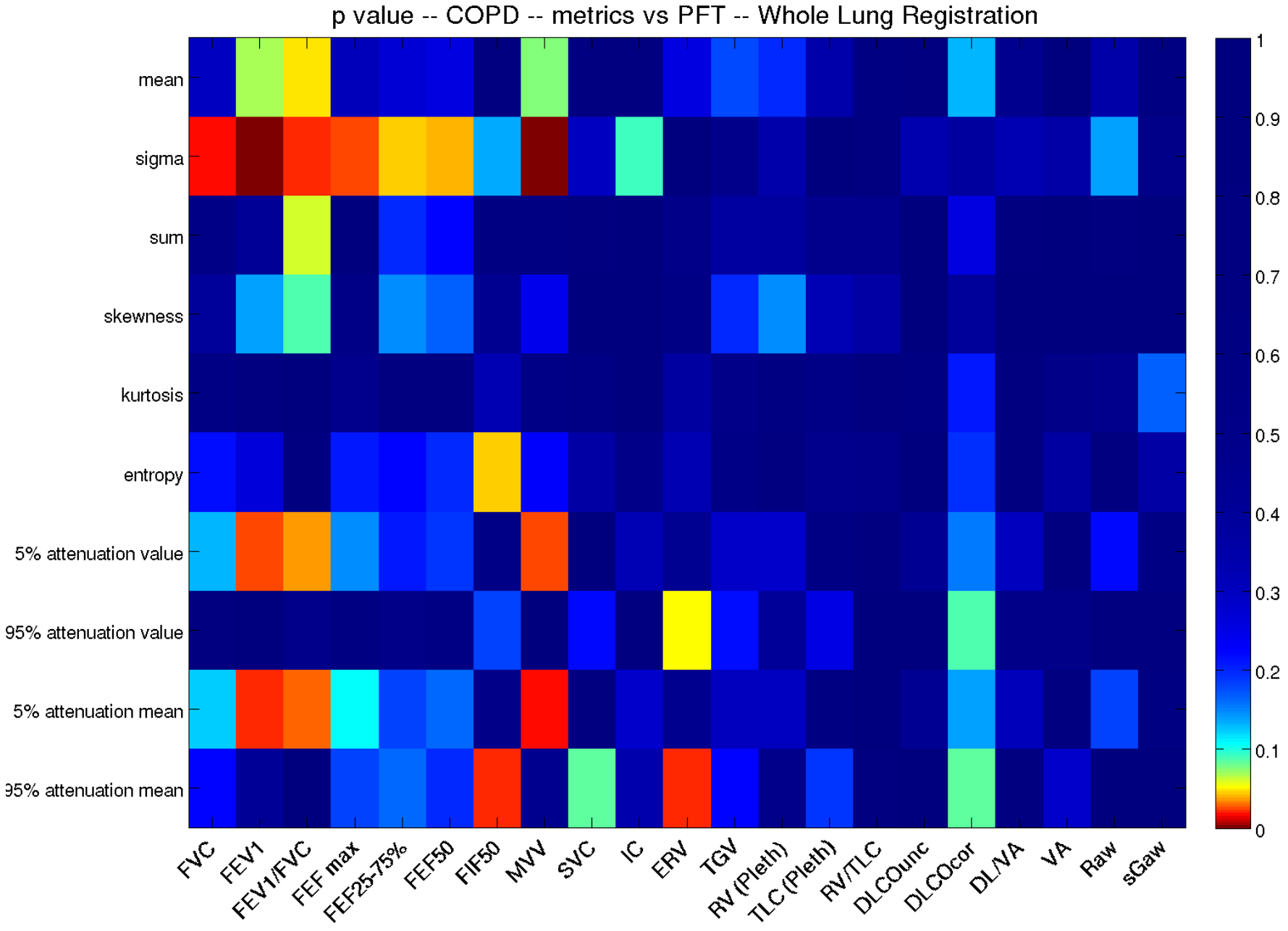

Figure 16: p-COPD—-metrics-vs-PFT—-Whole-Lung-Registration

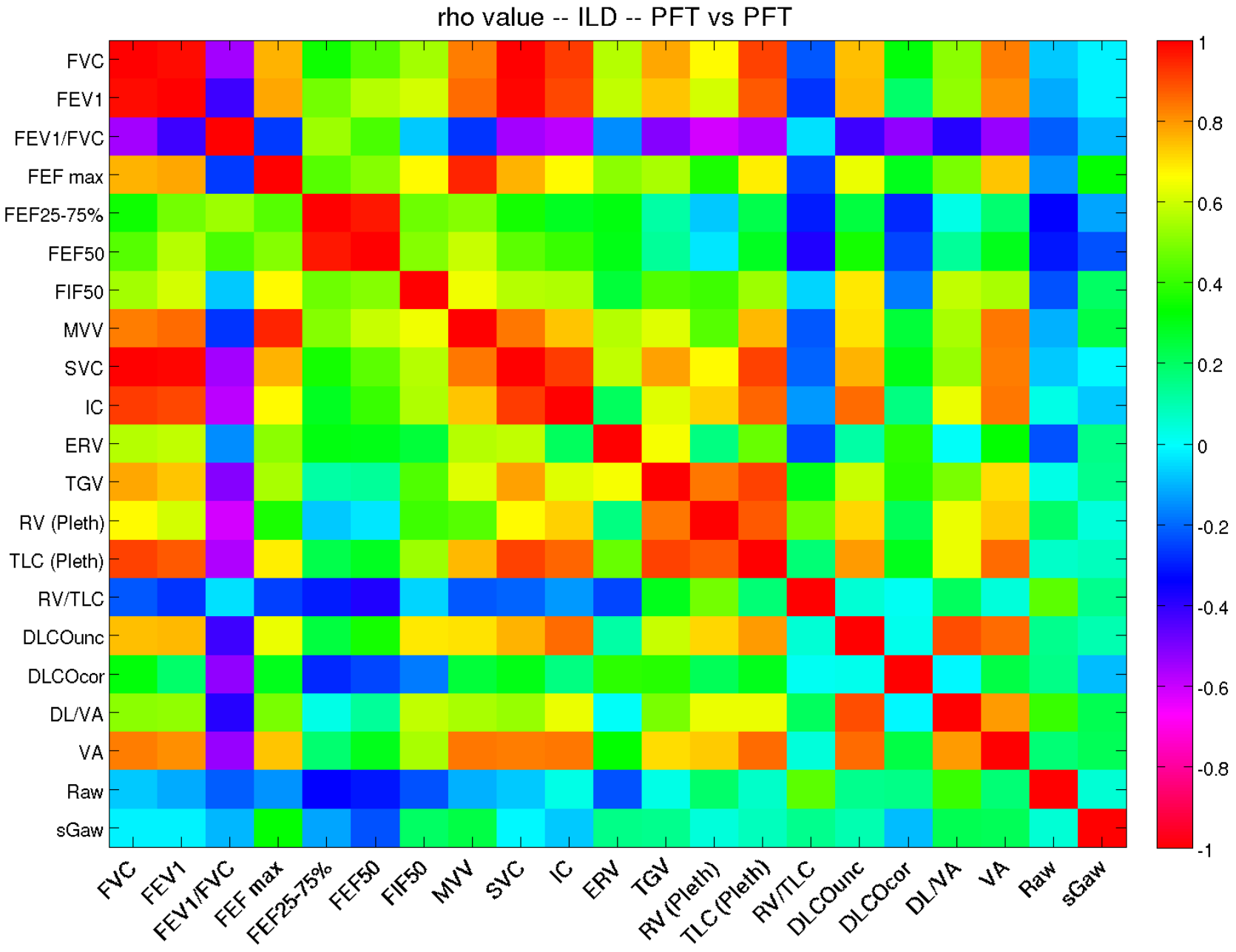

Figure 17: rho-ILD—-PFT-vs-PFT

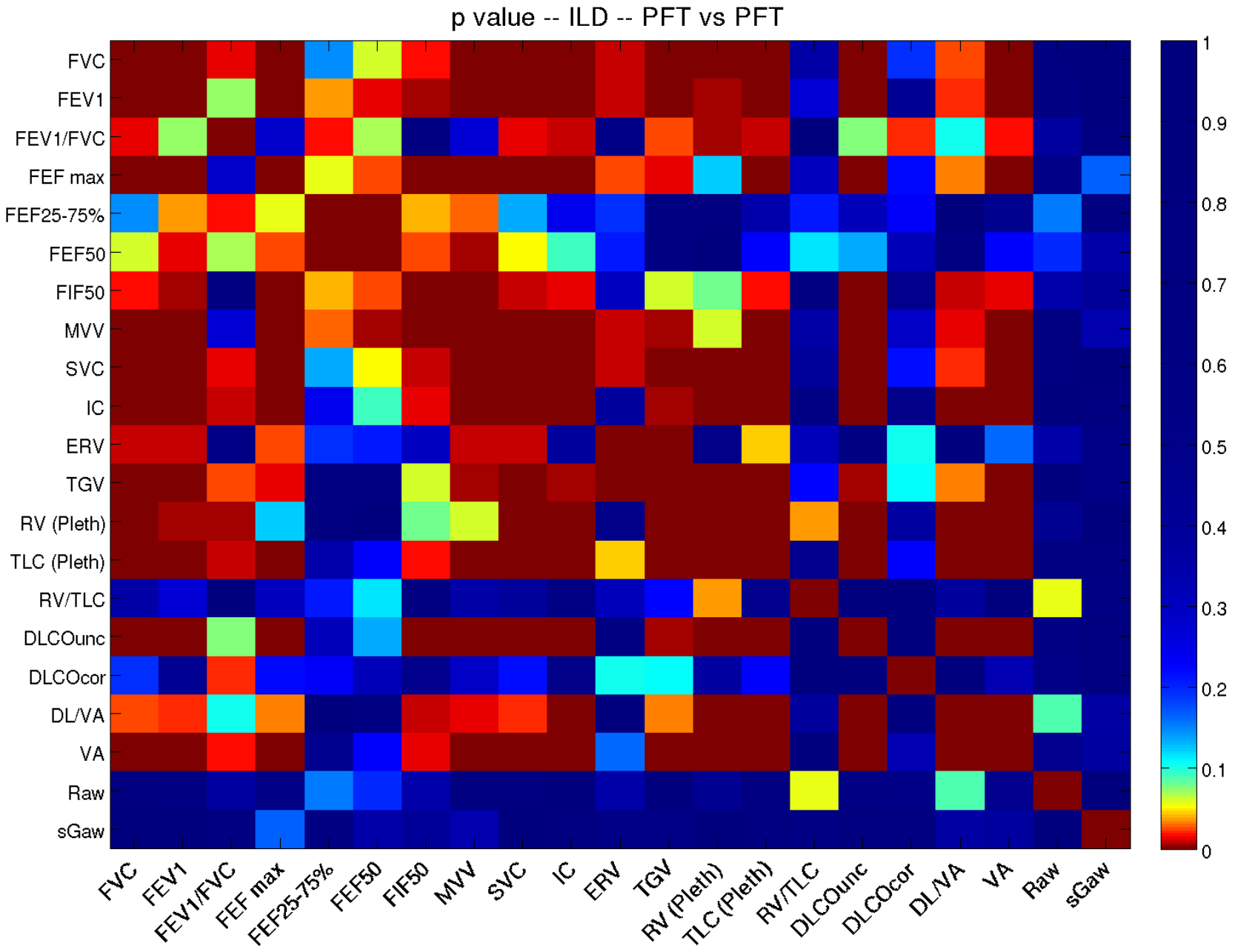

Figure 18: p-ILD—-PFT-vs-PFT

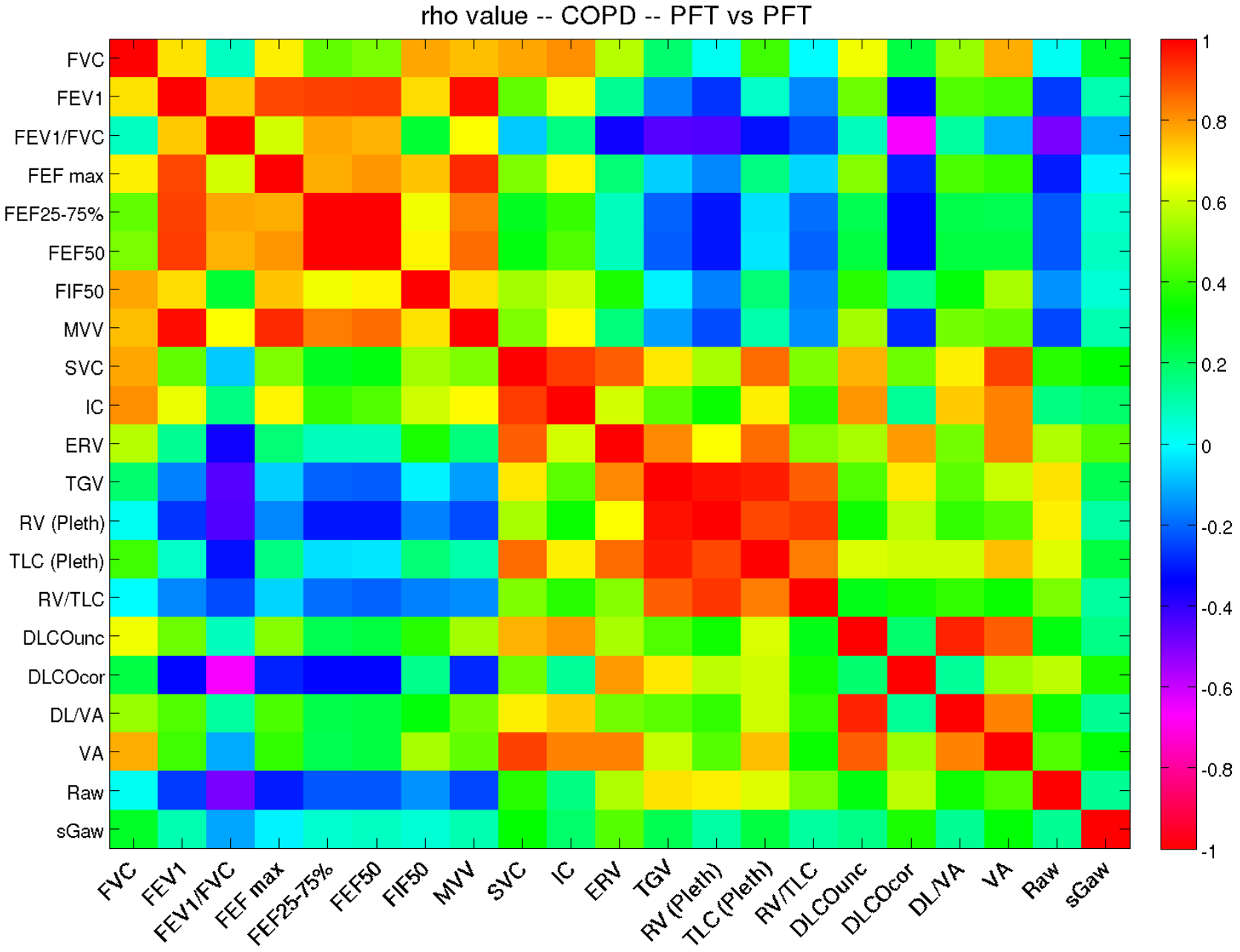

Figure 19: rho-COPD—-PFT-vs-PFT

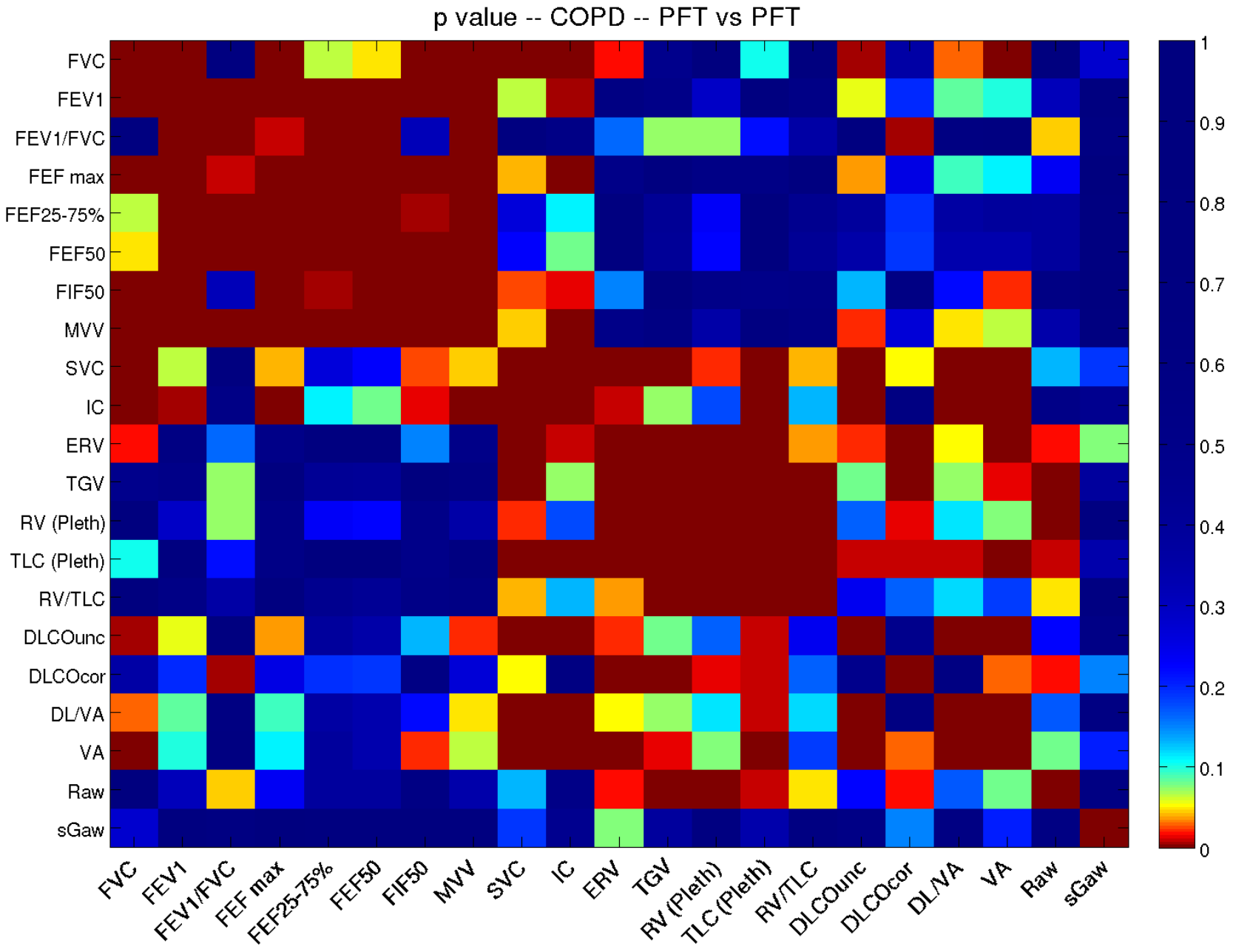

Figure 20: p-COPD—-PFT-vs-PFT

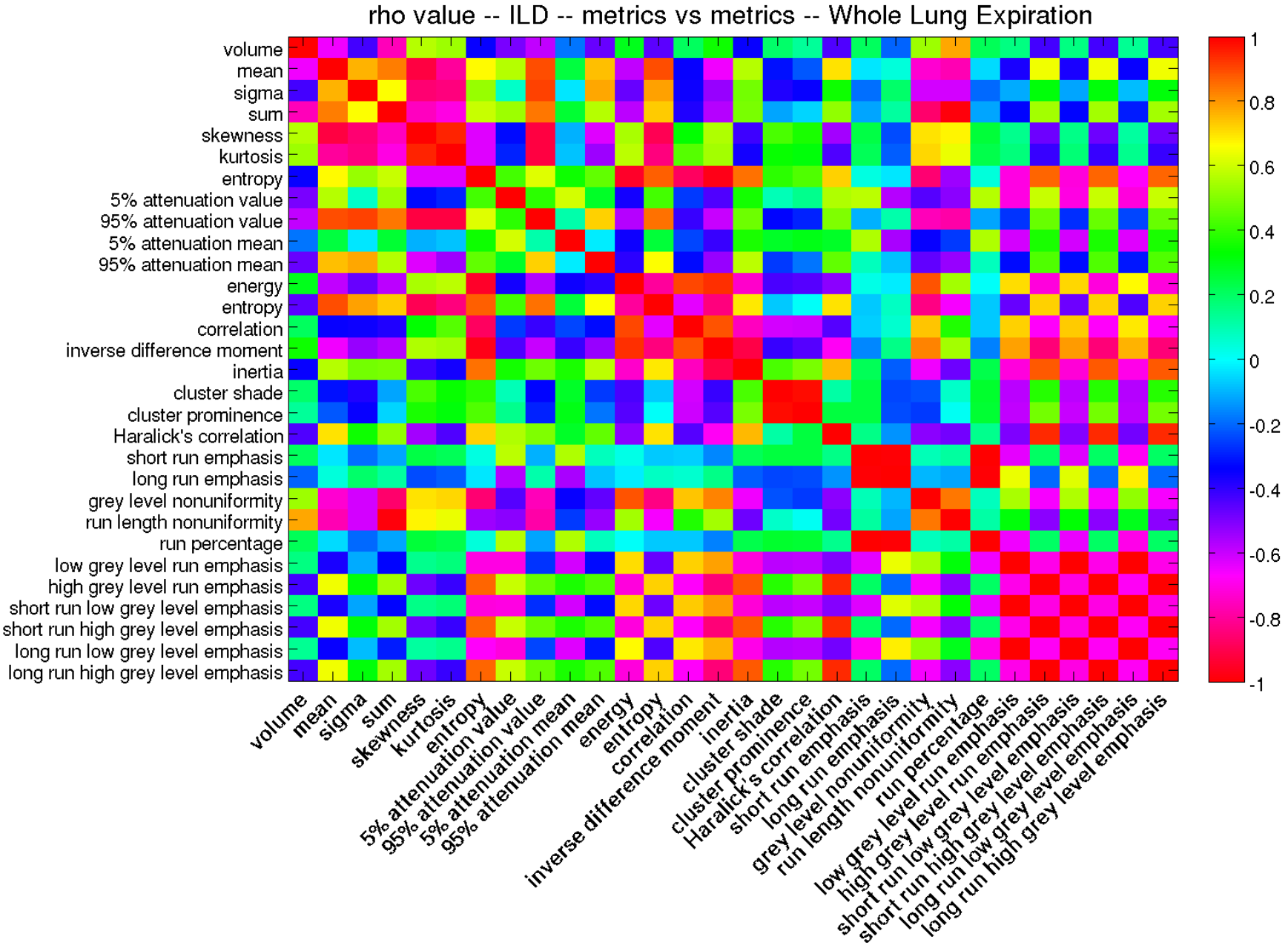

Figure 21: rho-ILD—-metrics-vs-metrics—-Whole-Lung-Expiration

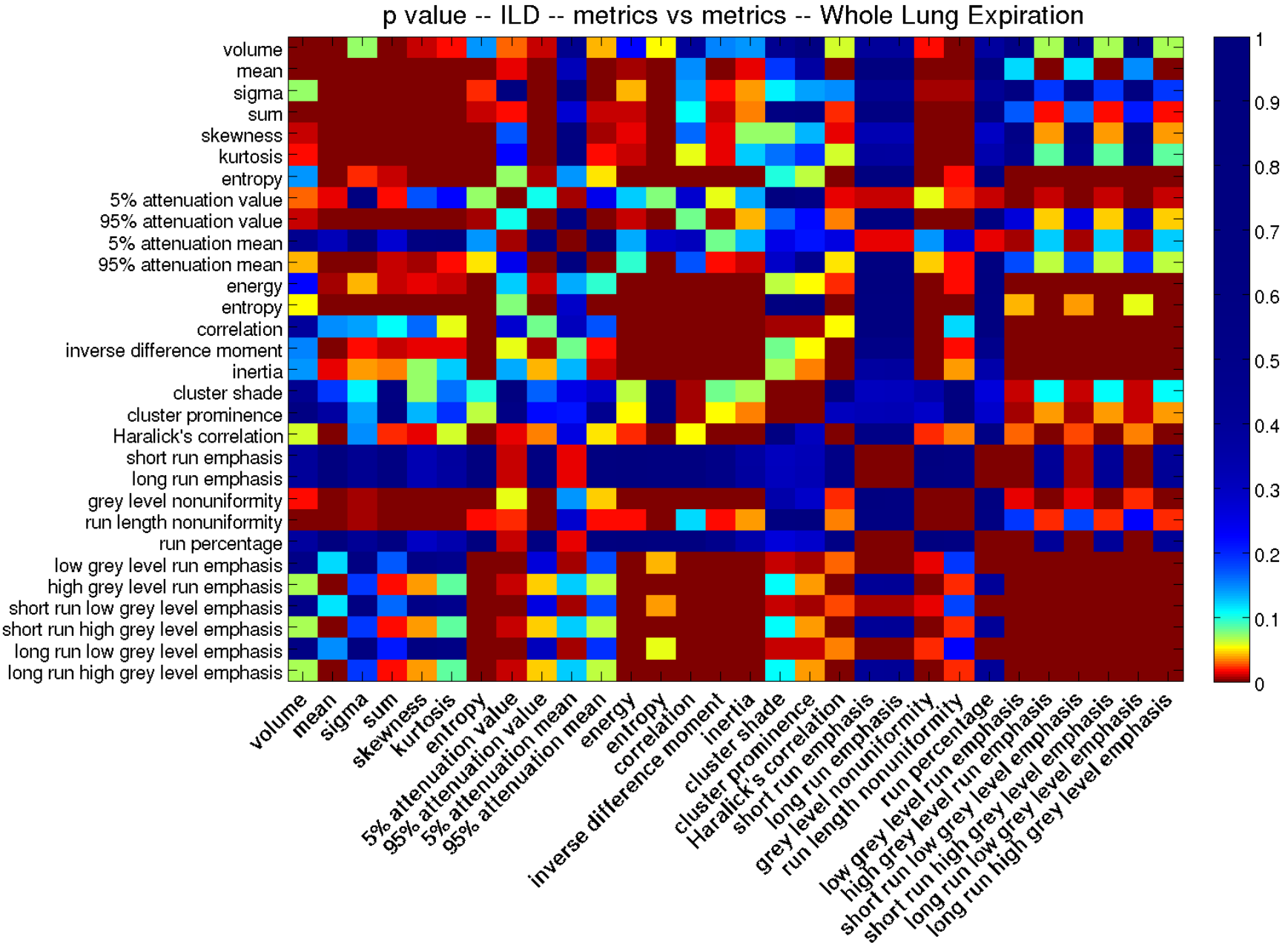

Figure 22: p-ILD—-metrics-vs-metrics—-Whole-Lung-Expiration

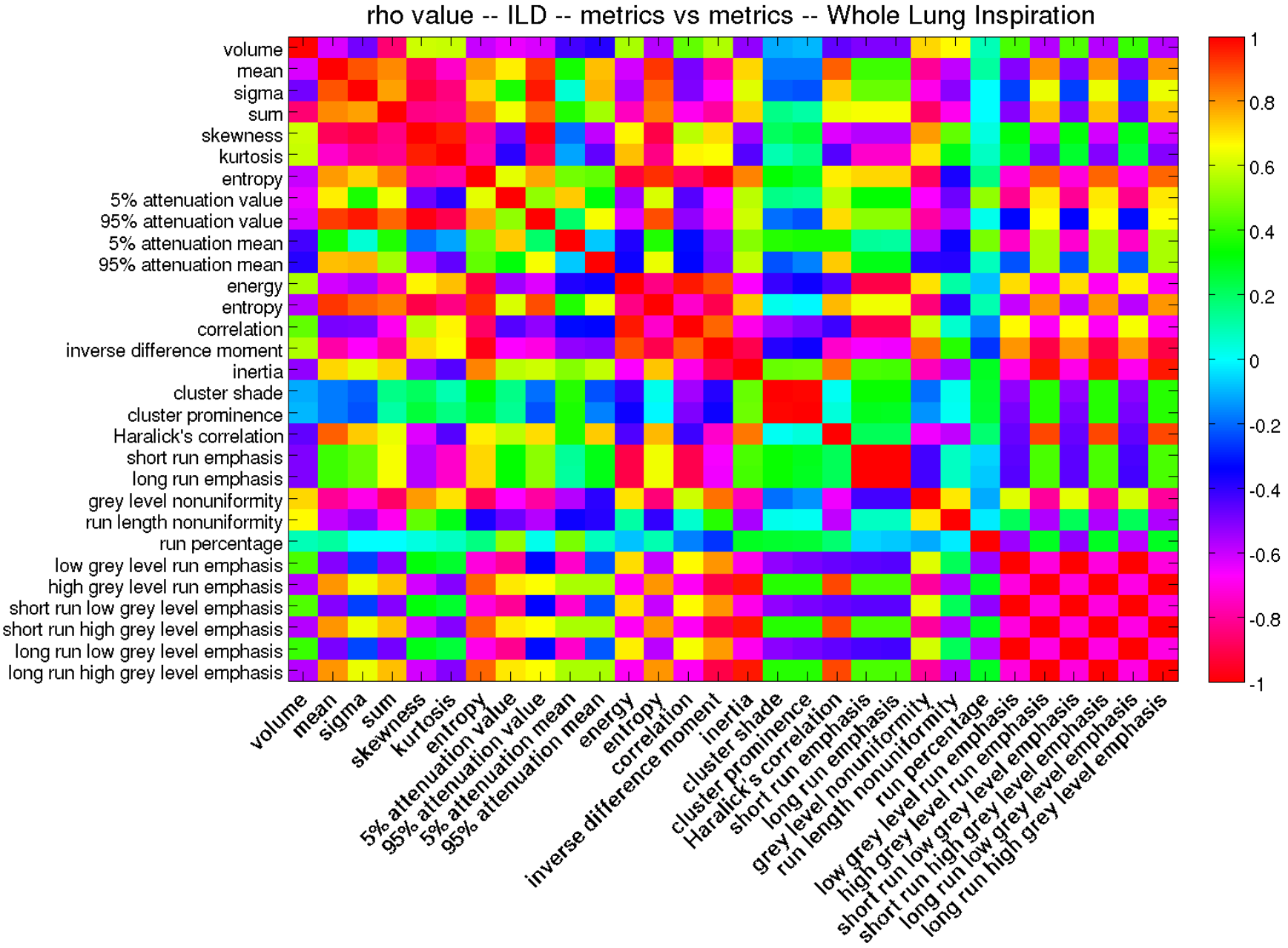

Figure 23: rho-ILD—-metrics-vs-metrics—-Whole-Lung-Inspiration

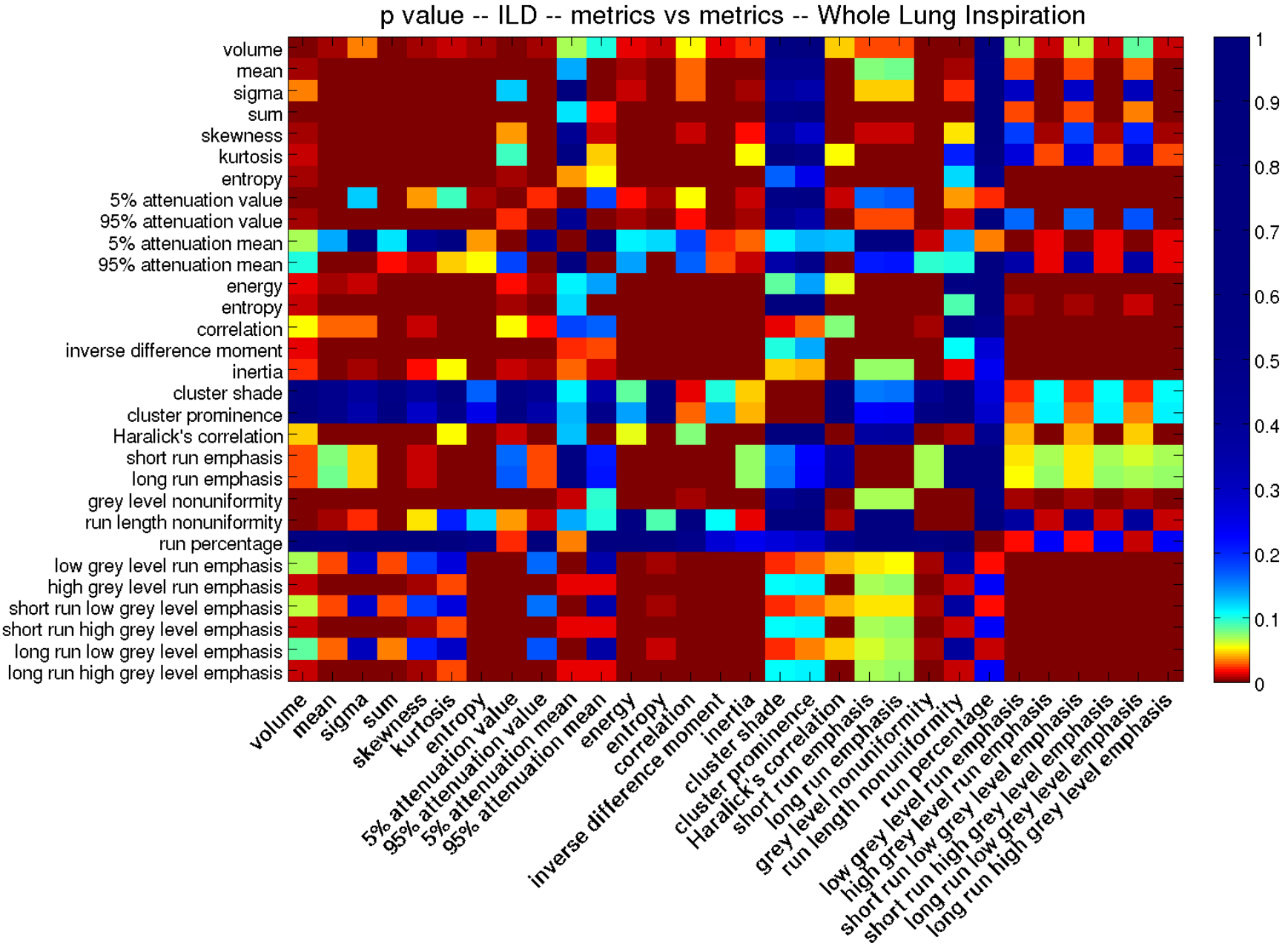

Figure 24: p-ILD—-metrics-vs-metrics—-Whole-Lung-Inspiration

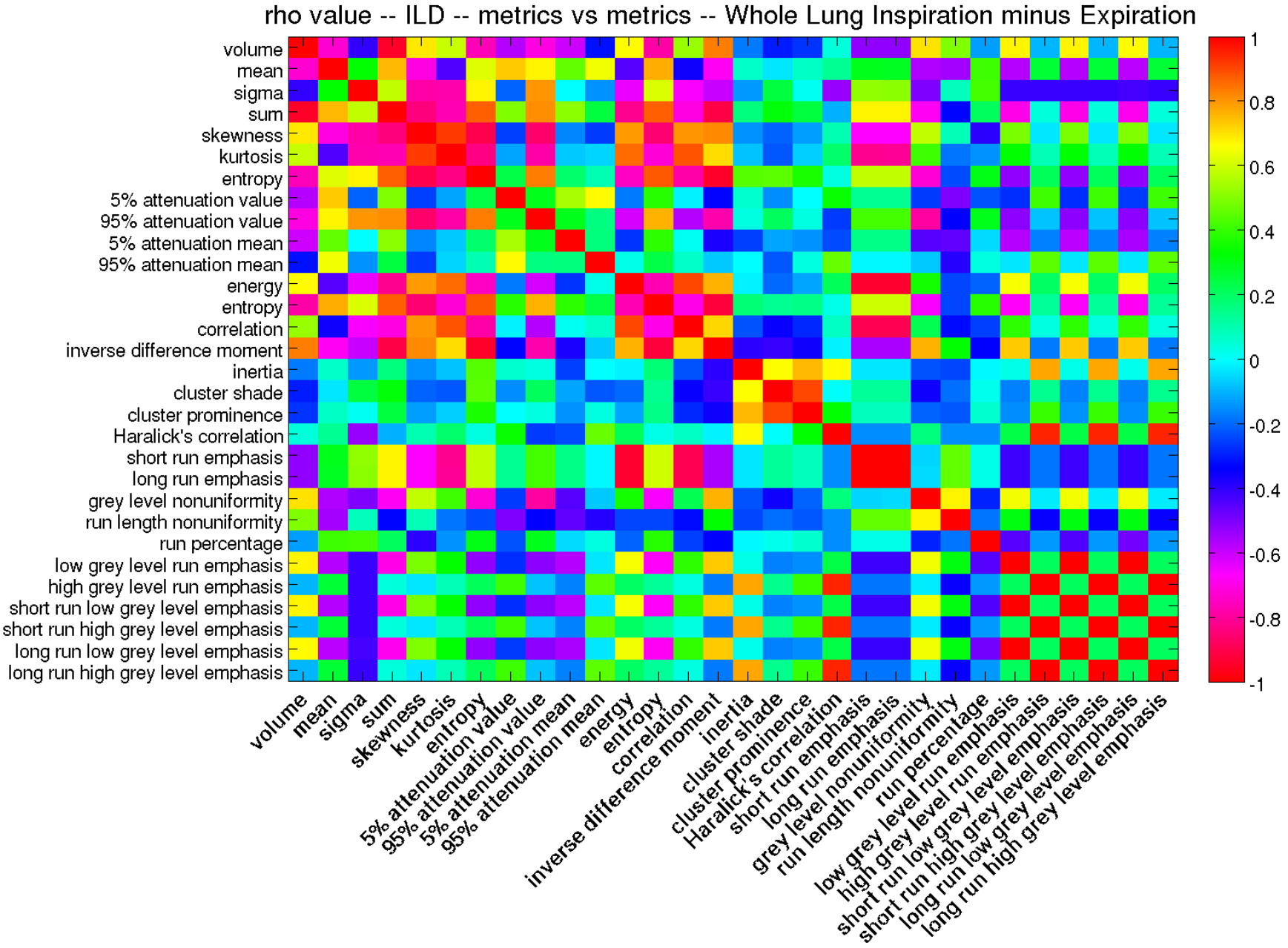

Figure 25: rho-ILD—-metrics-vs-metrics—-Whole-Lung-Inspiration-minus-Expiration

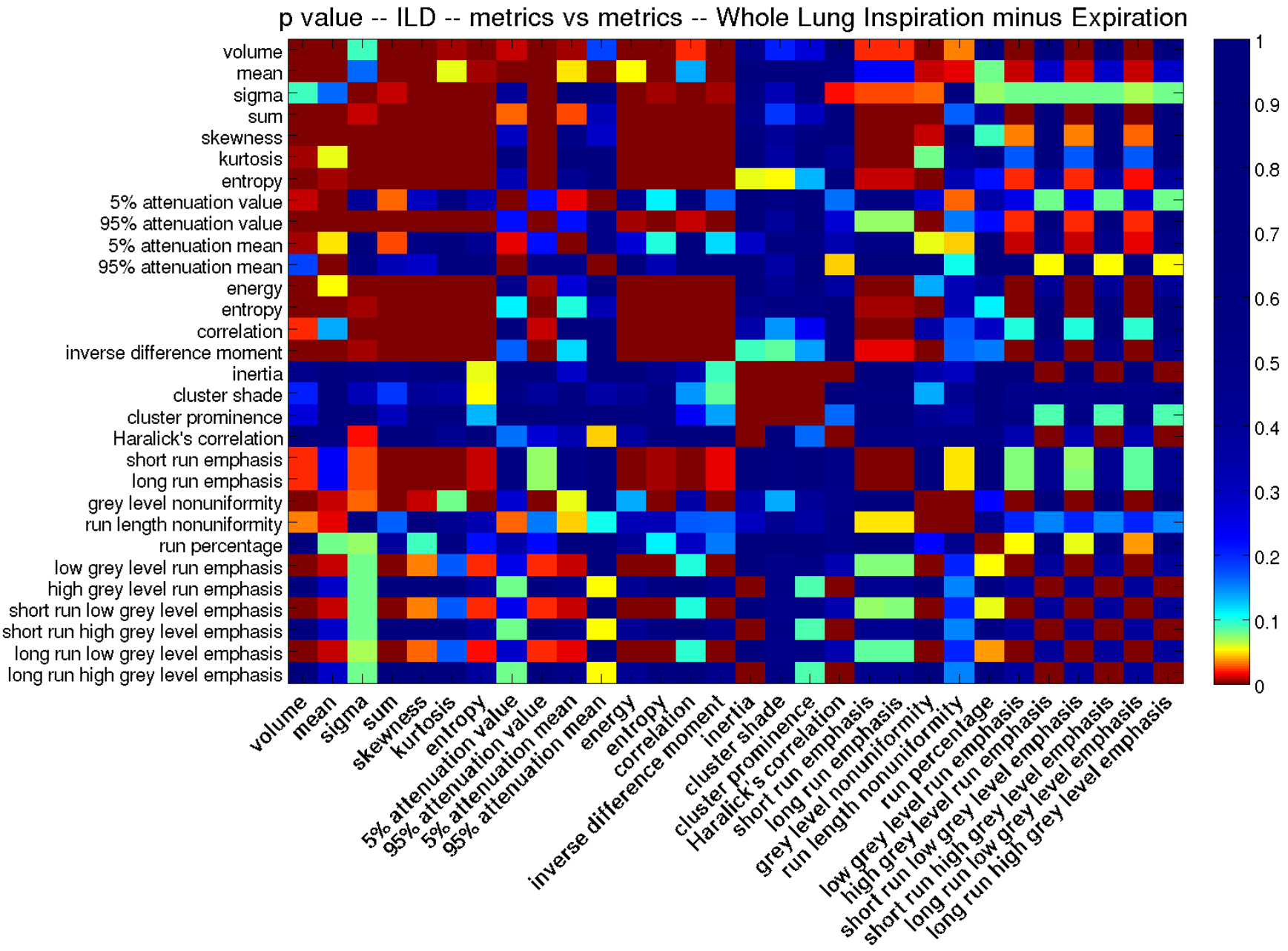

Figure 26: p-ILD—-metrics-vs-metrics—-Whole-Lung-Inspiration-minus-Expiration

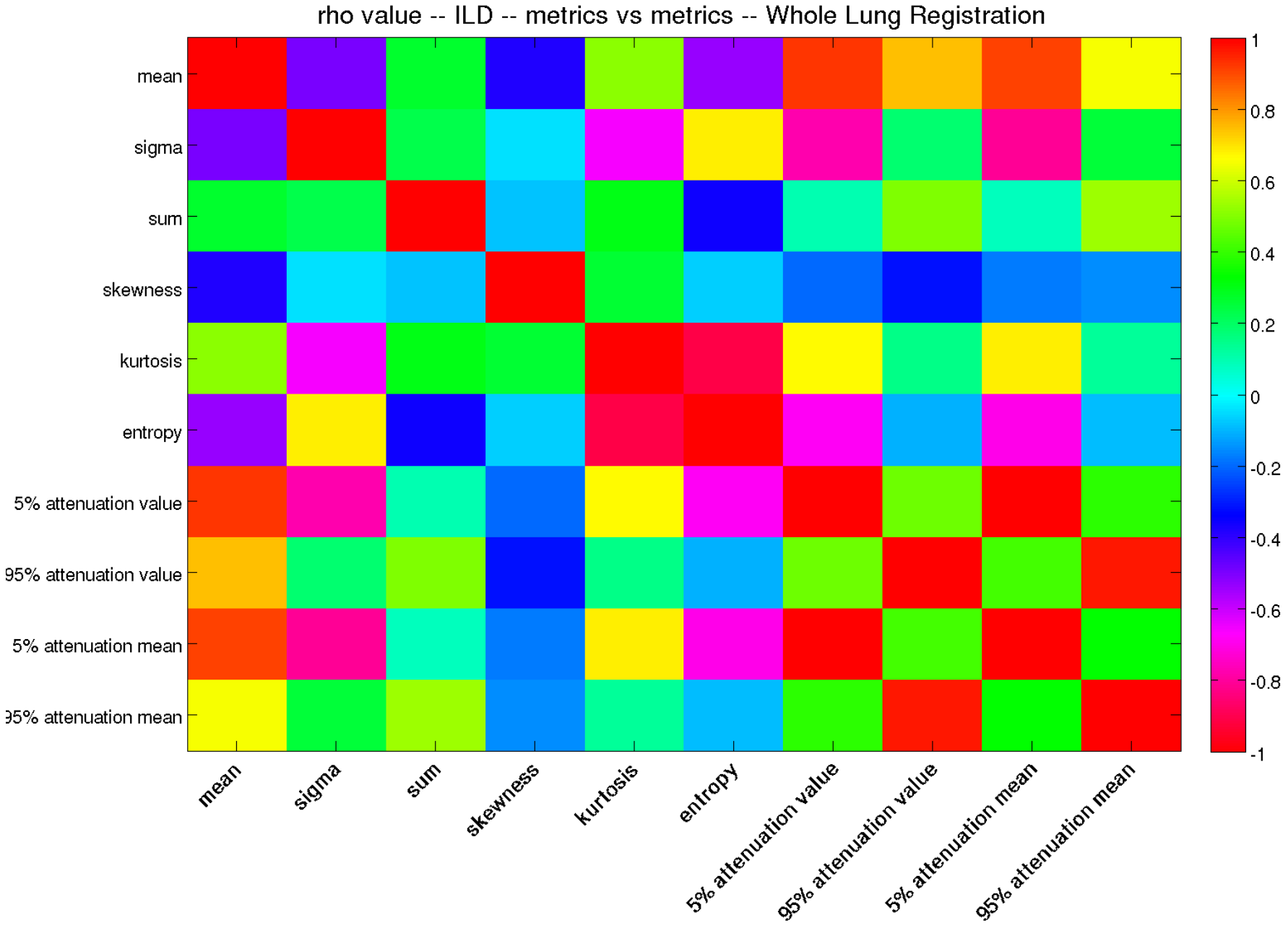

Figure 27: rho-ILD—-metrics-vs-metrics—-Whole-Lung-Registration

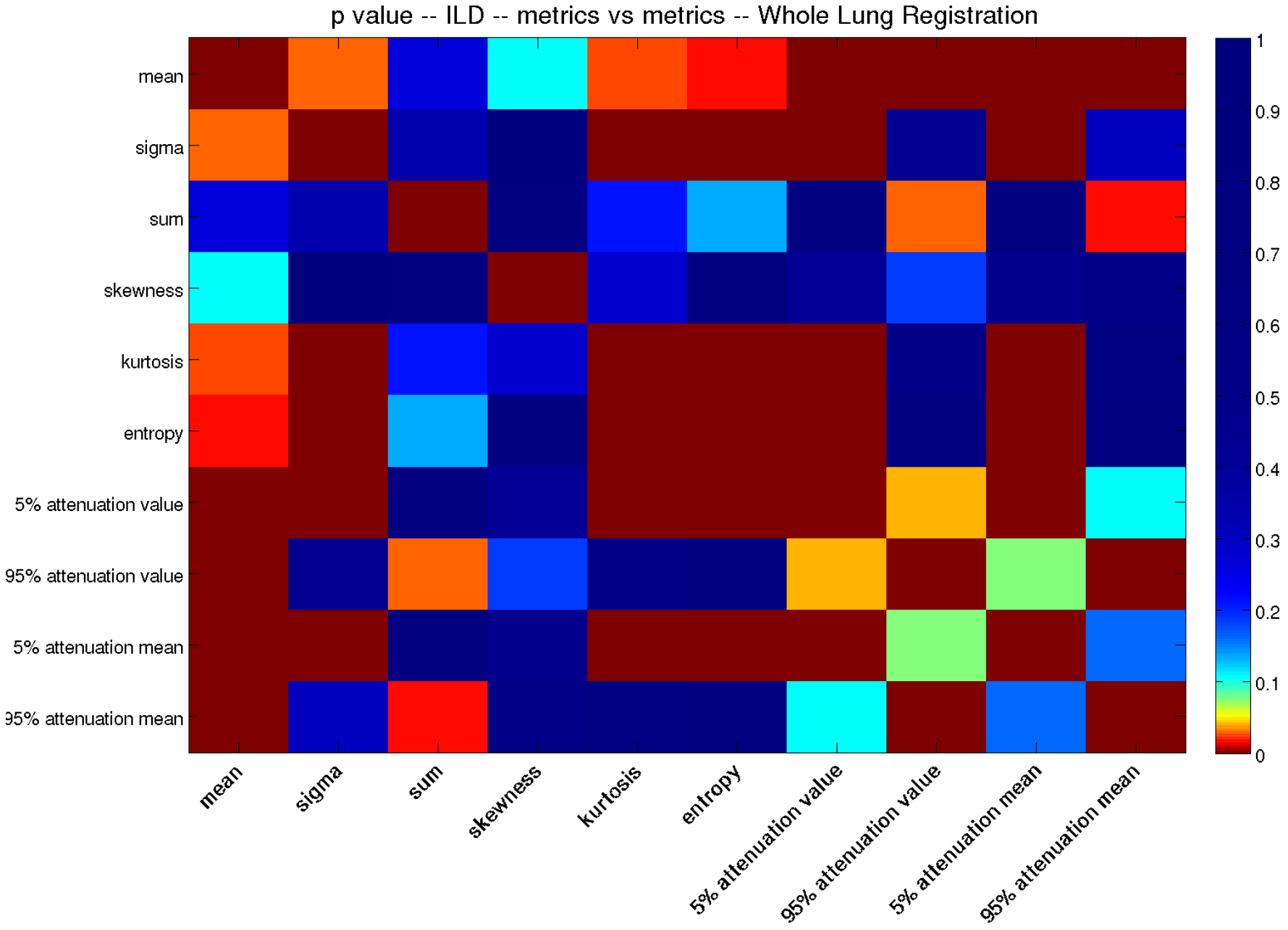

Figure 28: p-ILD—-metrics-vs-metrics—-Whole-Lung-Registration

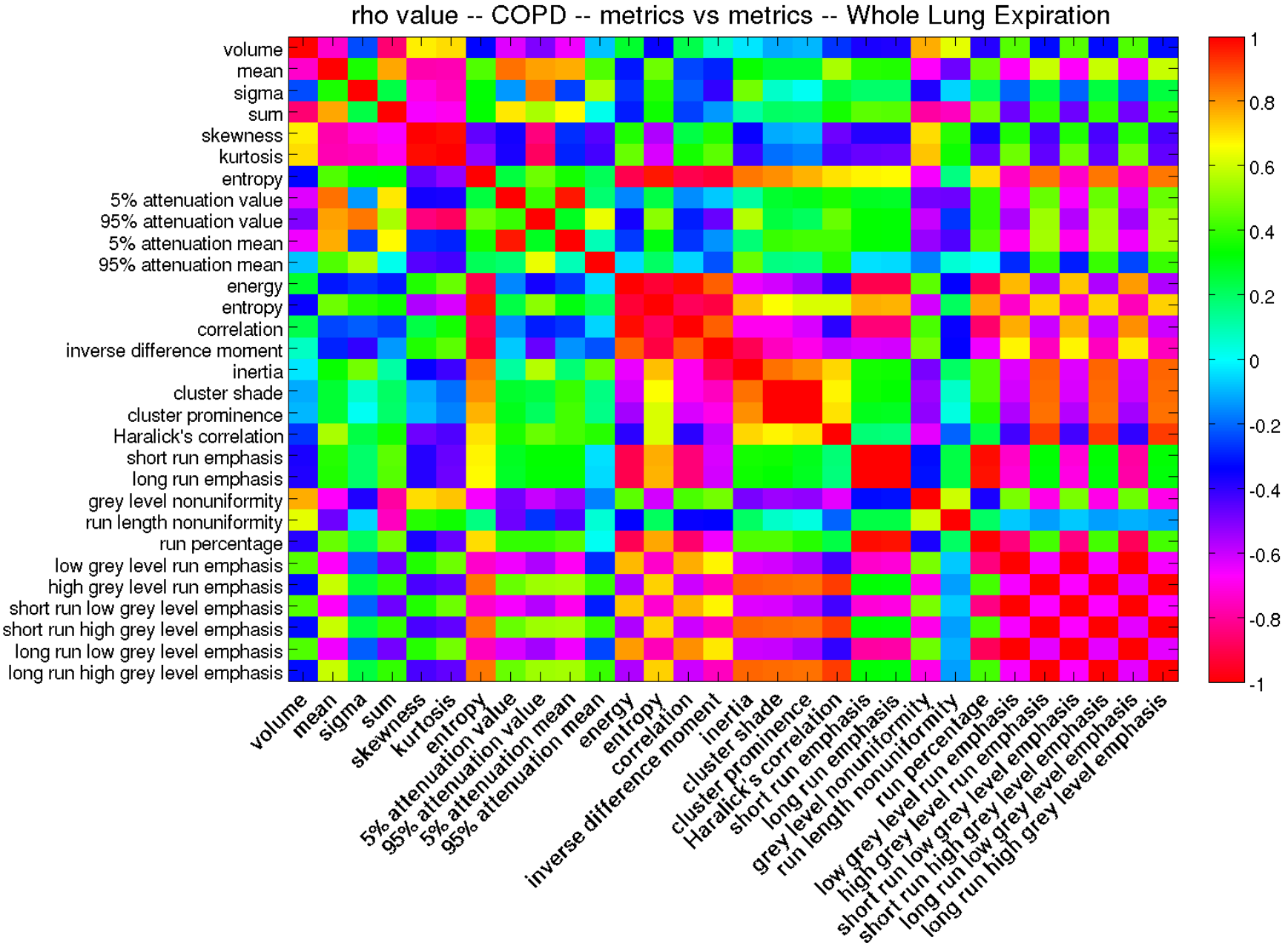

Figure 29: rho-COPD—-metrics-vs-metrics—-Whole-Lung-Expiration

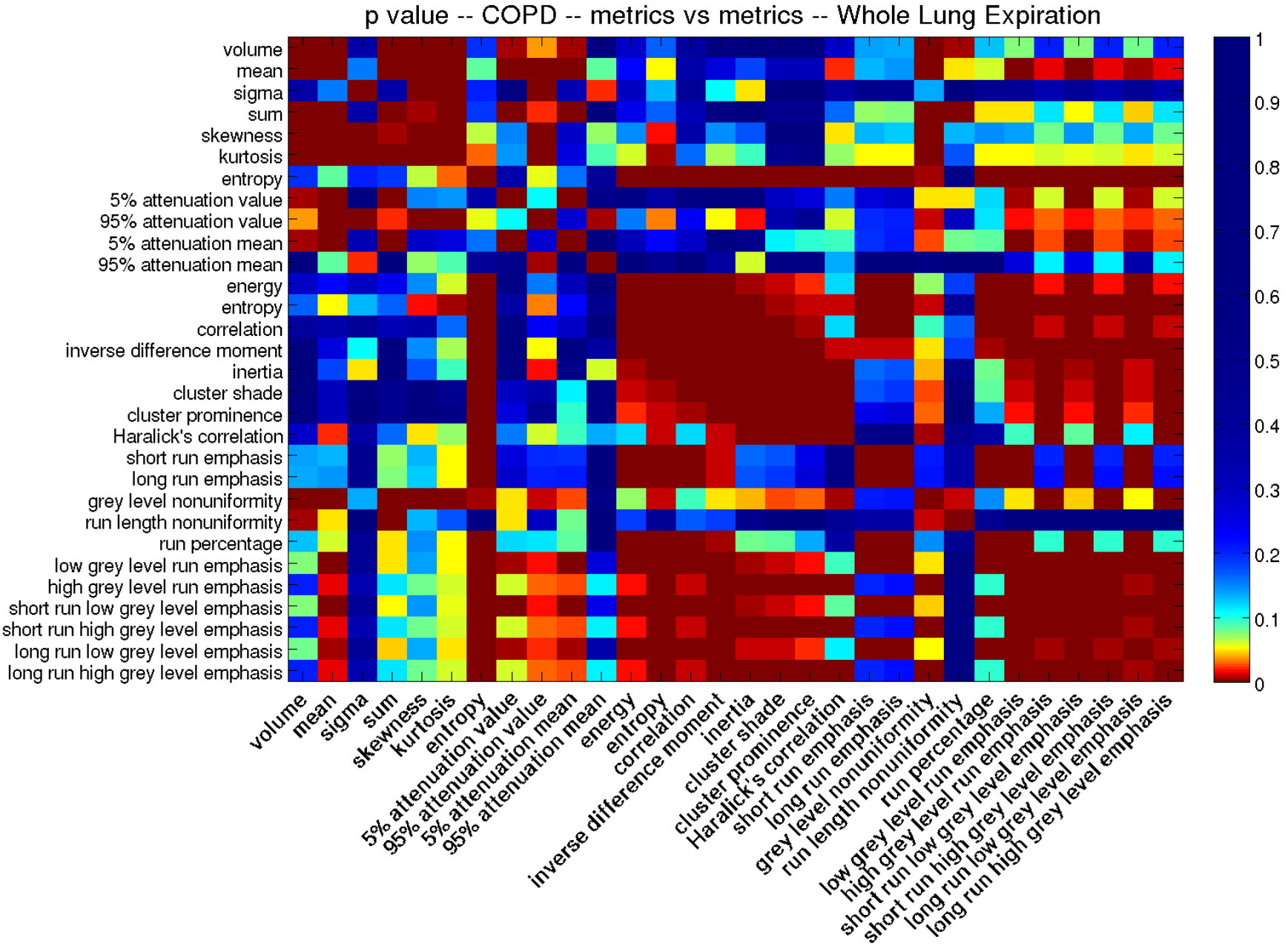

Figure 30: p-COPD—-metrics-vs-metrics—-Whole-Lung-Expiration

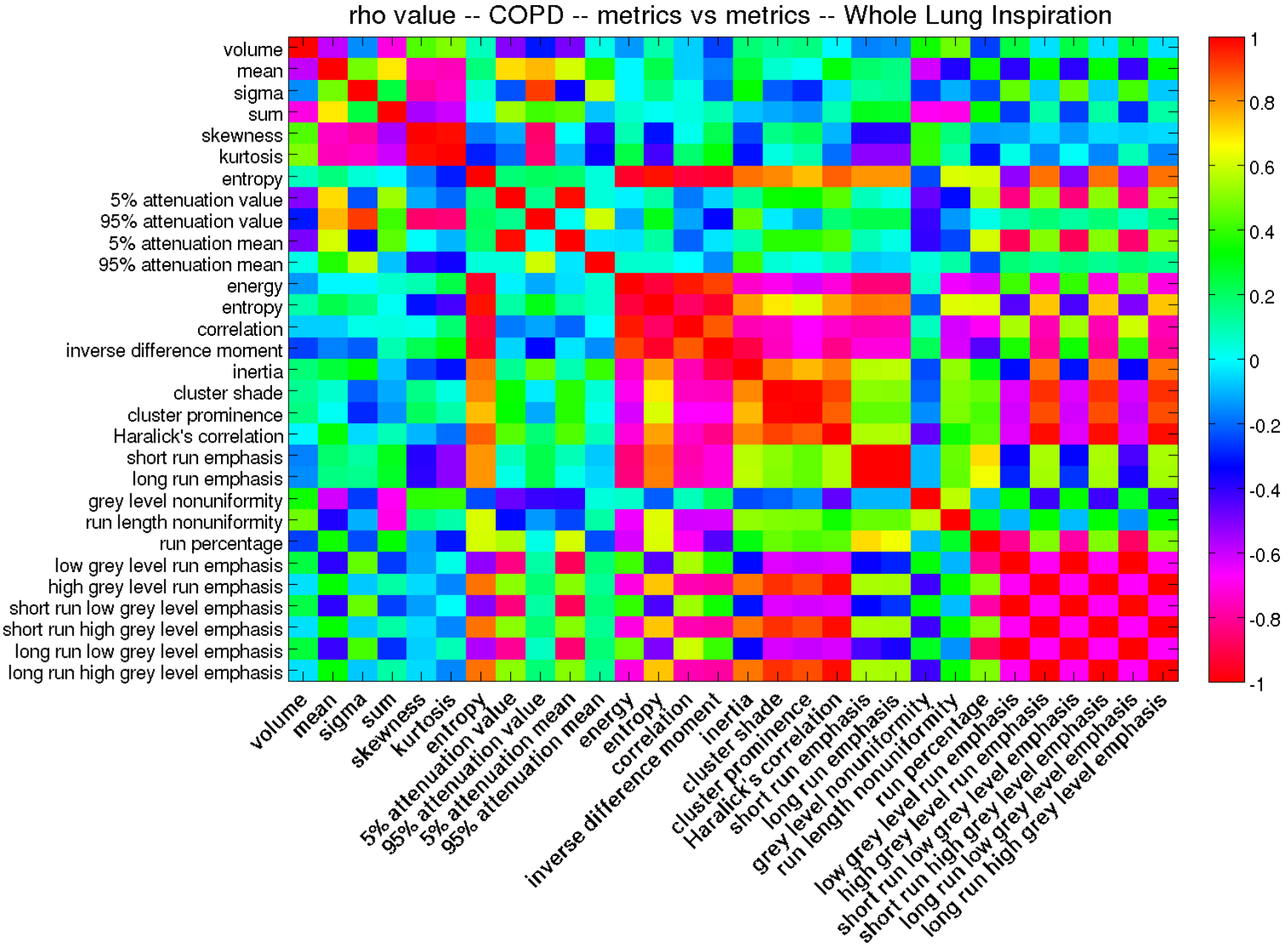

Figure 31: rho-COPD—-metrics-vs-metrics—-Whole-Lung-Inspiration

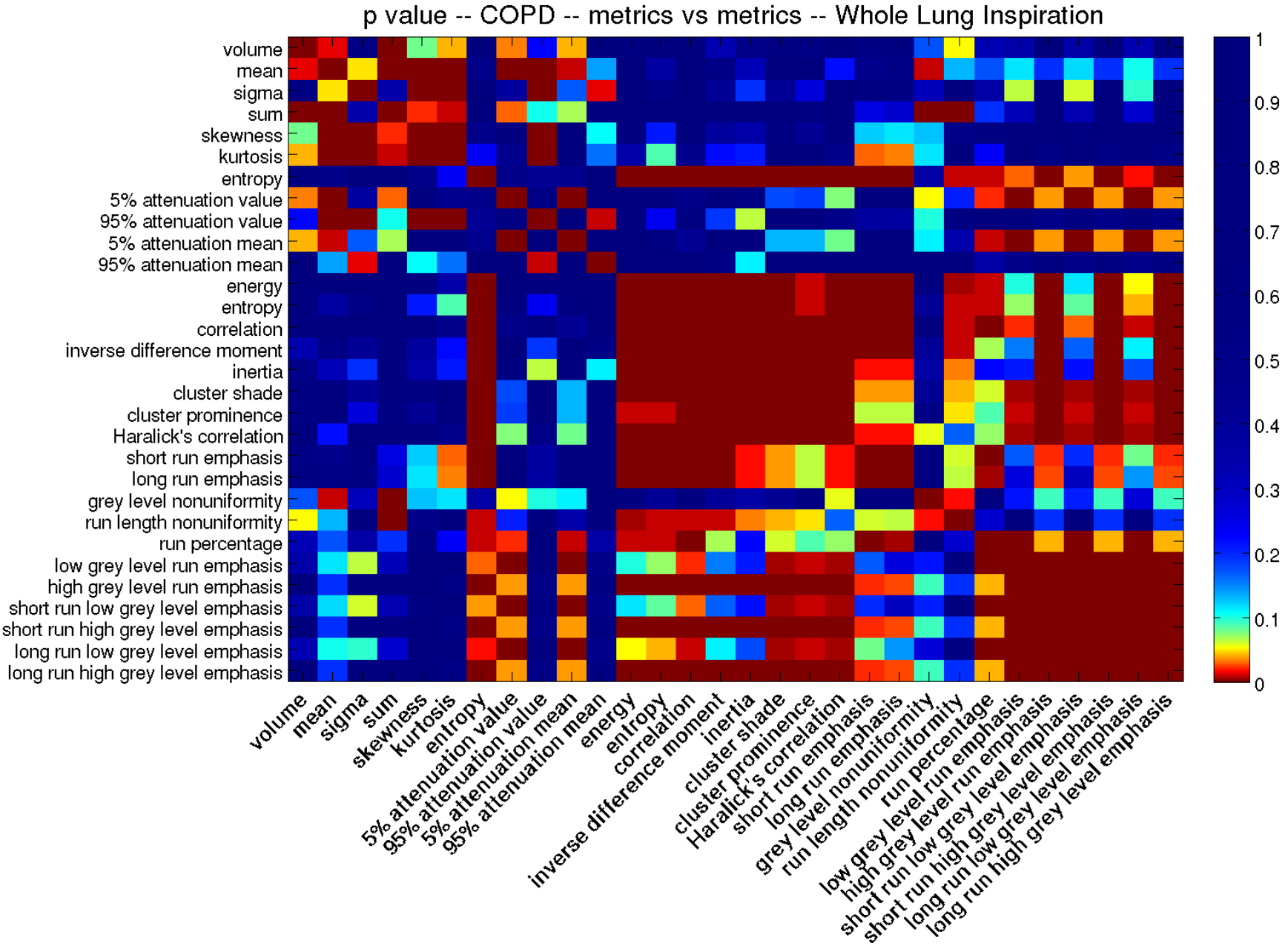

Figure 32: p-COPD—-metrics-vs-metrics—-Whole-Lung-Inspiration

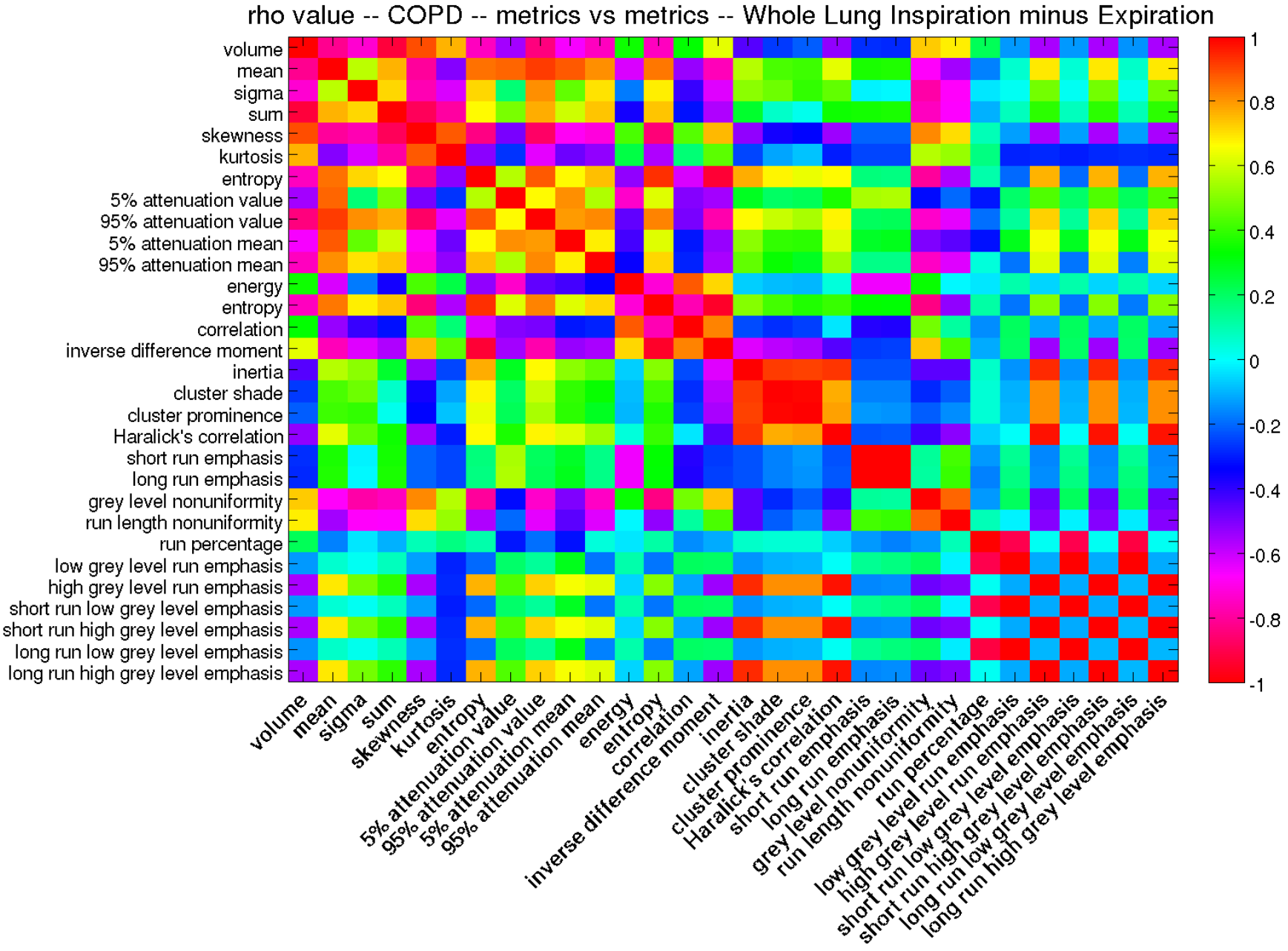

Figure 33: rho-COPD—-metrics-vs-metrics—-Whole-Lung-Inspiration-minus-Expiration

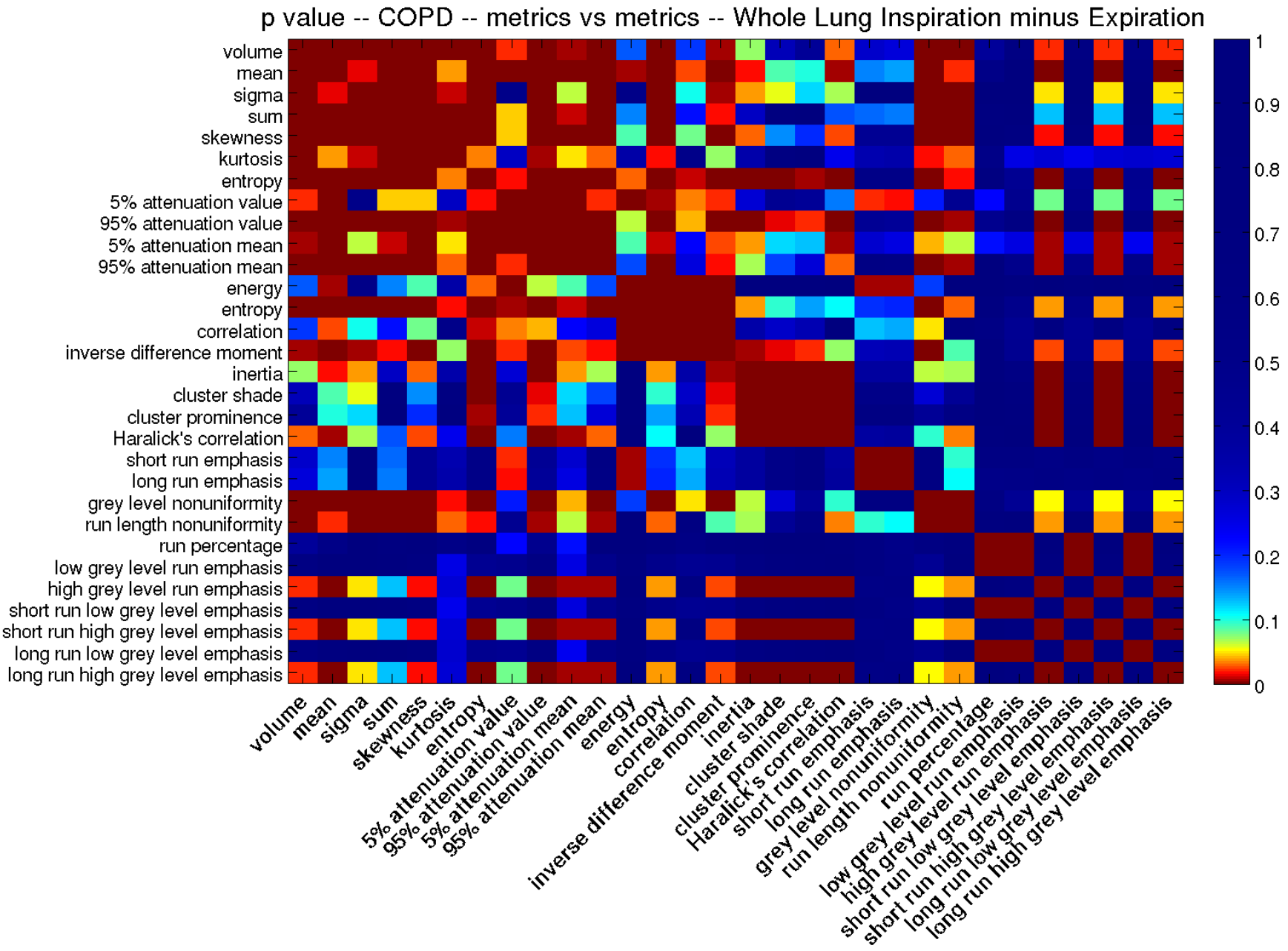

Figure 34: p-COPD—-metrics-vs-metrics—-Whole-Lung-Inspiration-minus-Expiration

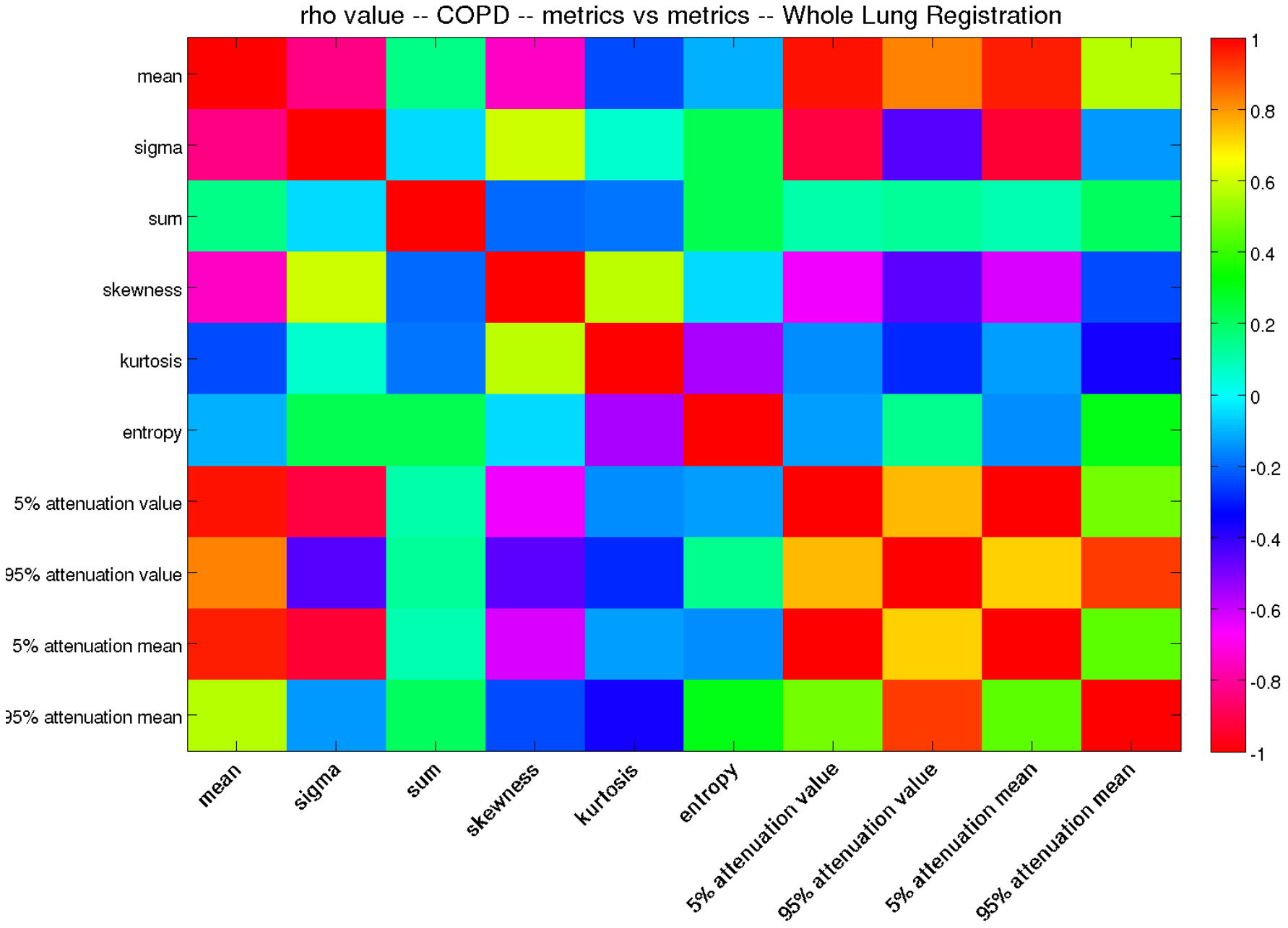

Figure 35: rho-COPD—-metrics-vs-metrics—-Whole-Lung-Registration

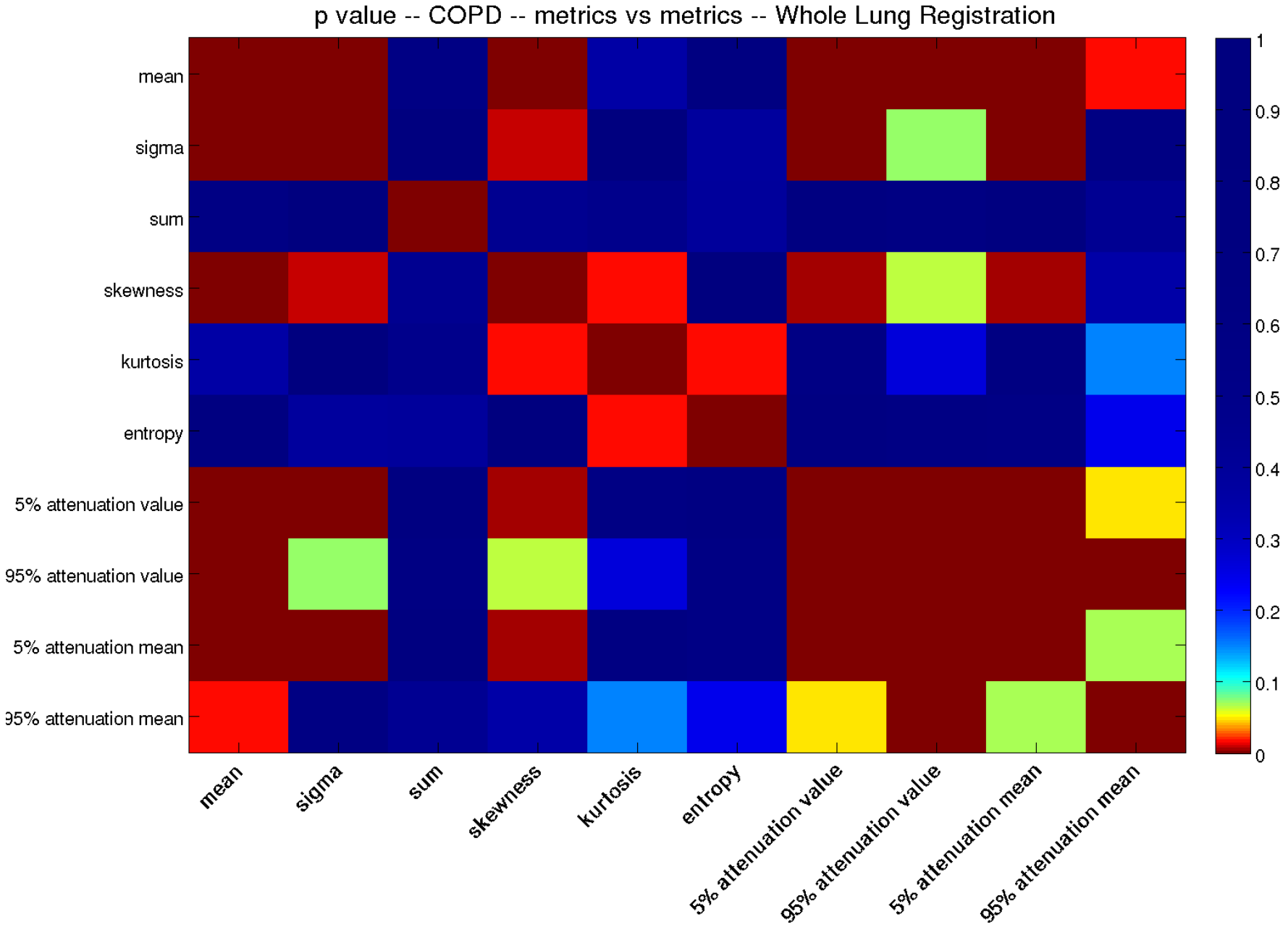

Figure 36: p-COPD—-metrics-vs-metrics—-Whole-Lung-Registration